The ELECTRICAL REVIEW

FOUNDED 1872

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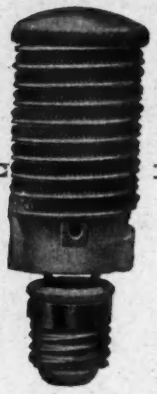

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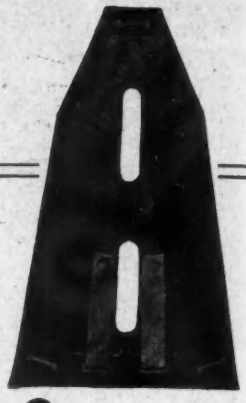

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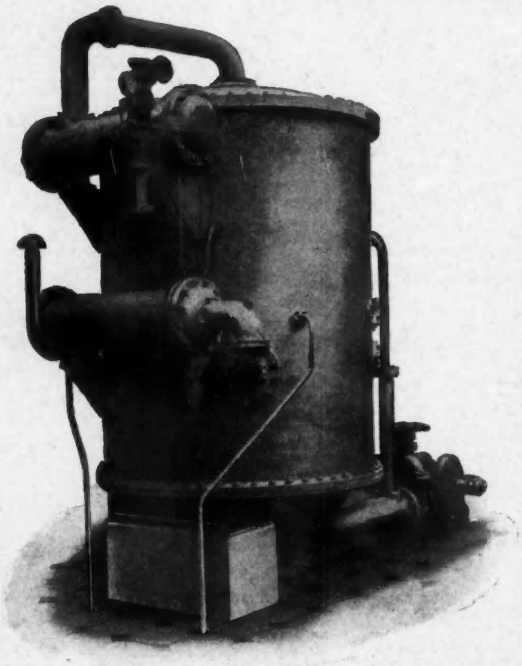

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The
Electrical Review

VOL. CXII. APRIL 28, 1933. No. 2892

THE OLDEST ELECTRICAL PAPER. ESTABLISHED 1872.

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Electrical Organisation

THERE can be no standing still in the matter of electrical organisation.

The changing state of the industry as we advance renders imperative a constant study of the trend of things, the preparation of soundly conceived schemes for adjustment or replanning, and a willingness to show adaptability to altered conditions.

The foundations of most of our organisations were laid many years ago, when technically and commercially the electrical industry differed greatly in size and character from what it is to-day. In certain fundamentals there may be no need for revision, yet, while we are prepared to give full credit to the expert organisers who have from time to time introduced changes in matters of detail, and added section to section, we must not dope ourselves with past achievements or somnolently get into a rut.

Movements in progress in both Britain and the United States are making a call upon electrical men to re-equip themselves for the work of future development. Our American electrical friends are at present occupied with a piece of reorganisation which was forecast a short time ago—the winding-up of the National Electric Light Association and the substitution therefor of the newly formed Edison Electric Institute. The supersession of that Association affords a most striking example of an organisation with a wonderfully successful past proving inadequate for the needs of the year 1933. It played a leading part in electricity supply development for very many years—its conventions and its sectional activities stirred our admiration—but it has come to an end.

It is not clear just what place the new Institute will fill in the industry, but we learn from our New York contemporaries that the Sales Section of N.E.L.A. held its final session in Chicago in March. Committee-men wound up the affairs of their departments and drafted recommendations regarding specific activities which it is felt should be continued. Their proposals, to which reference is made in our "Business Notes" to-day, will come before a Convention which the Institute will hold in Chicago in June.

The attendance at the March meeting was not large—under 100—but the commercial activities of the Institute were fully discussed and the need for dealing with general sales problems was stressed.

Vice-President E. W. Lloyd, of the Commonwealth Edison Company, "sensing the haziness of the meeting in regard to the future," is reported to have outlined the new Institute as an organisation with a membership of 2,000 at a $10 subscription, limited to employés of operating or holding companies. The limitation of membership is designed to ensure that only men who are experts in their subject will be appointed to the committees which "will replace the old sections in the new organisation." Leading commercial men in every company are being urged to join at once as individuals, before they are "edged out" of their opportunities by men from other departments.

The information so far available does not remove the obscurity surrounding the movement sufficiently to enable us to see whether this American reorganisation can assist us in our own deliberations. Conditions are quite dissimilar in the two countries.

The Heating of Flex

THE old problem of embrittlement of rubber insulation becomes more insistent with improving standards of illumination and with the higher filament temperatures of gas-filled lamps. The technical report of the committee representing various interests set up by the British Electrical and Allied Industries Research Association and presented before the I.E.E. shows that even below 200-W loadings the temperatures reached are much in excess of those permissible without oxidisation of the rubber. Whatever may be the tendency in large buildings, the use of flex has obvious economies in small houses, and in such cases domestic appliances up to 600 W will be connected to lampholders, especially with two-part tariffs. The question was raised during the discussion as to whether

it was the duty of the fittings manufacturers to deflect the heat from the flex or of the cable makers to provide leads that were really flexible but less affected by temperature. Probably both parties will be stimulated by this paper to contribute a share towards the solution of the problem. It is most important to maintain the tendency to secure greater illumination from the same wattage rather than to accept the higher efficiency of lamps to reduce energy consumption.

The Return from Moscow

THE welcome home given to Mr. Monkhouse and the three other engineers of the Metropolitan-Vickers Co. has been both enthusiastic and general. His Majesty the King, Ministers of State, Sir Felix Pole, and the people themselves have emphatically expressed their conviction that the Soviet charges were unfounded. The returned engineers have stated very plainly that Messrs. Thornton and Macdonald, who have not yet been released, are as innocent as themselves. But, as Mr. Baldwin told the House of Commons early this week, discussion of the embargo and related matters is not desirable while Britons remain in prison in Russia.

Goose-killing in Scotland

AN electrical contractor, writing to a Glasgow newspaper, complains that the city tax of 10 per cent. per annum on the capital cost of an electric sign is losing him orders every day from small shopkeepers. This would appear to provide an example of a tax that defeats its own object of furnishing revenue, as against its yield must be set the loss of energy consumption provided by the Corporation's electricity undertaking and of local employment. Moreover, anything that causes a belief that more electricity means more taxation is not conducive to electrical progress. Scotland appears to favour this sort of thing, for only a few months ago a stir was caused by the revelation of the Linlithgow Assessor's practice of raising the rating of a house when electricity was substituted for gas, following the bad example set by the Edinburgh Assessor.

Distress and a Remedy

CORRESPONDENCE and papers received by the last mail from New Zealand stress two closely related and important electrical matters. First, there is extensive professional and industrial electrical distress, without any organised means for rendering assistance. Secondly, it is urged that if New Zealand had a publicity organisation concentrating effort upon developing the domestic load many unemployed men could be absorbed and the various undertakings could quickly earn at least £125,000 additional annual income. A Wellington contemporary says that it is beyond all dispute that at the present time a large and remunerative load is awaiting development if only the problem is tackled in the right way. Many thousands of people out there can afford to buy domestic electrical appliances, and it is confidently asserted that they will do so if only their interest is aroused and their appetite whetted. It is remarked that any one of the larger gas companies spends 50 per cent. more than all the supply authorities in New Zealand put together. Electricity supply interests are urged to build up a fund by contributing a proportion of their revenue and to prepare a definite campaign.

Important Radio Conferences

Two international conferences of considerable importance to radio broadcasting authorities are to take place shortly. At the first, which will be held at Lucerne, Switzerland, on May 15th, an effort will be made to reorganise the allocation of available wavelengths among transmitting stations in Europe, part of Russia, Turkey, Palestine, and North Africa. The second will be held in France, on June 22nd, coinciding with the Paris High-Voltage Conference, and has been convened by the International Electro-technical Commission, with the object of inviting the co-operation of all interested in the suppression of artificial electrical (as distinct from atmospheric) interference with broadcast radio reception. The formation of a joint committee to draft recommendations to form the basis of legislation in different countries will be considered. Considerable preliminary work has already been done by the Comité Consultatif Radioélectrique of the International Union of Telegraphy, which is representative of Government administrations, in co-operation with the International Broadcasting Union, but it is felt that the aim should be pursued on broad lines, with the fullest understanding between electrical manufacturers and suppliers of electricity.

Pumping and Tariffs

A YEAR ago, in commenting upon the Pontefract pumping case, we drew attention to the value of a power load in reducing the distribution costs per kWh in sparsely populated areas, thus enabling the supply undertaking to charge lower rates than would otherwise be economically possible. Evidence for this argument now comes to us from Louth (Lincolnshire), which is supplied in bulk from Grimsby. Electricity tariffs are to be lowered to all classes of consumers; this reduction has been made practicable largely owing to the decision to substitute electricity for steam at the municipal waterworks. The addition of this pumping load will enable the standing charges on the transmission system to be spread over a larger consumption, and the relief will be logically in the primary component of the two-part tariffs in force.

Oil-electric Traction

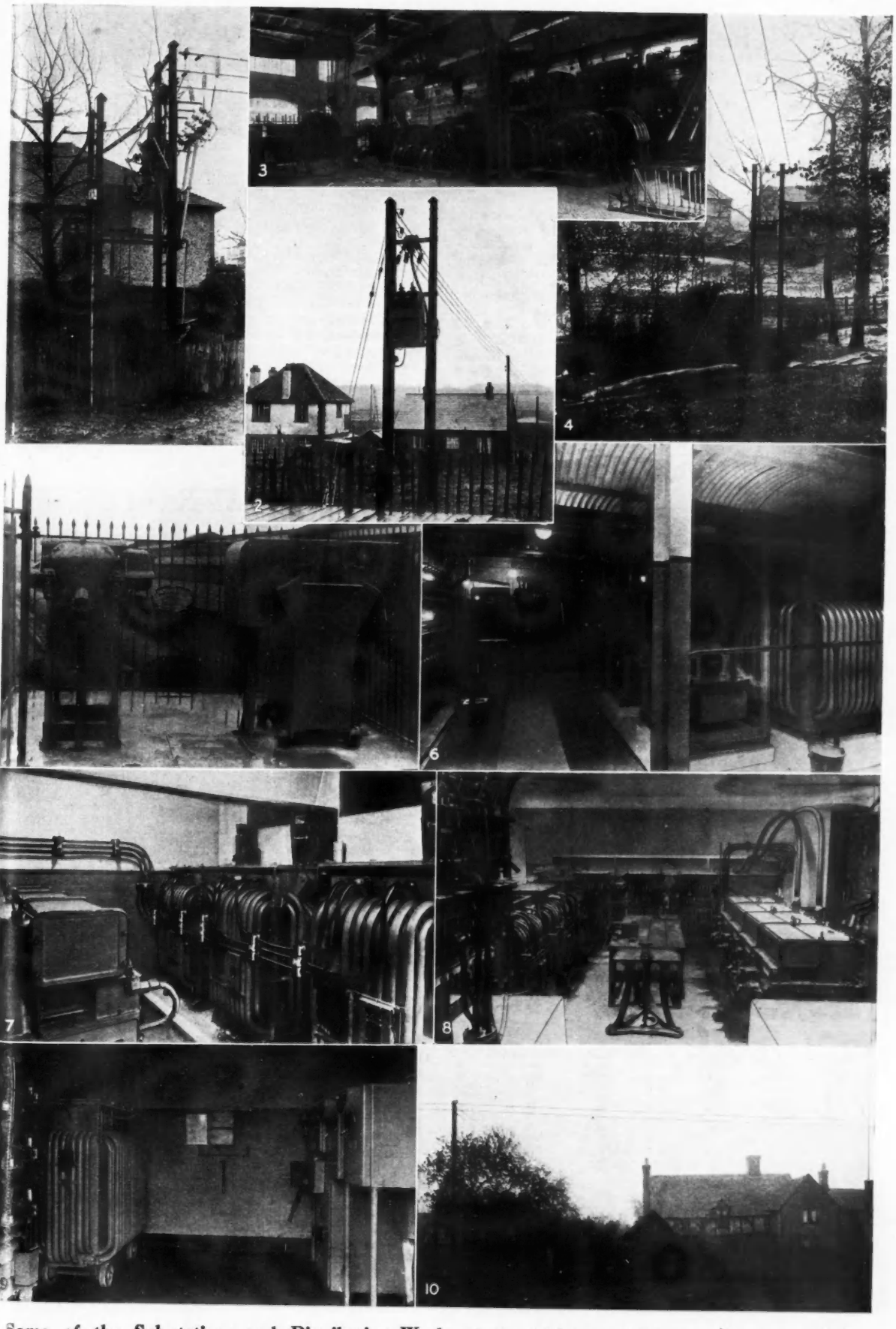
THE "Tyneside Venturer" Diesel-electric coach has now had a successful year's run of 50,000 miles on the L.N.E.R. suburban system round Newcastle-on-Tyne and in North Yorkshire. Since it was put into service Sir W. G. Armstrong, Whitworth & Co. have received several orders for oil-electric locomotives from abroad, no doubt as a result of their pioneer work in this field. The performance reported is what we should have expected from the modern heavy-oil engine; the real test would be to compare the service for dense suburban traffic with that given by a straight-electric system also embodying the most recent developments and taking into account the probability of a large proportion of underground mileage. An order placed by the L.M.S. for a shunting locomotive, also of 250 h.p., is probably of much greater practical interest, as in shunting and branch lines, haulage, or in the opening-up of areas where the traffic density is low we see the greatest scope for the oil-electric system.

The Budget

INDUSTRY in general is likely to share the view of the President of the Federation of British Industries that the failure of the Budget of 1933 to afford it some relief from direct taxation is a deep disappointment. Such relief would have given the encouragement needed in order to hasten the return to prosperity. Against the slight relief afforded by the lowering of the companies' capital duty are set very heavy increases in vehicle taxation, in which electrically propelled vehicles are involved.

To-day's Meetings

MEETINGS of two electrical organisations will be held at the Institution of Electrical Engineers this afternoon. The National Register of Electrical Installation Contractors will consider the annual report of the Executive Committee, regarding which we offer certain comments on page 603. This gathering will be followed by the annual meeting of the Electrical Industries Benevolent Association (hitherto known as the E.T.B.I.), at which a speech on recent changes in the organisation is to be delivered by Mr. R. P. Sloan, the president.



Some of the Sub-stations and Distribution Work of the "Metesco" Group. (See page 589)

1. A typical h.p. terminal pole, with pull-down switch, serving an isolated district. 2. A 50-kVA pole transformer serving a four-wire line with "all-through" threaded insulators. 3. Converting equipment at the Fisher Street sub-station. 4. A 50-kW pole transformer supplying a hamlet. 5. An outdoor sub-station at Acton (Crompton Parkinson equipment). 6. Brook Mews North sub-station, showing Scott-connected transformers and (left) a Reyrolle panel installed in 1897. 7. B.E.T. transformers in the Holborn Vaults sub-station. 8. The Cable House sub-station under construction (Whitehead S. & C. h.p. switchgear). 9. Power Road sub-station, Brentford, showing Ferguson, Pailin h.p. switchgear with wing isolators on the right. 10. A l.p. line taken behind cottages in Flaunden to preserve the amenities of the village

The Rural Domestic Load. By "Oakwood"

An analysis of some actual results

A STATISTICAL survey was recently made in two districts of a relatively sparsely populated agricultural district. The inhabited areas were, respectively, 75 and 121 sq. miles and the population densities 233 and 117 per sq. mile, with fifty-five and thirty premises (including farms) per sq. mile.

District 1 contained twenty-eight towns and villages with populations of from 106 (70.7 per sq. mile) to 3,193 (1,330 per sq. mile). The number of residences and farms in each centre varied from 22 to 778 (14.6 to 324 per sq. mile). Average rateable values ranged from £10.35 to £21.0, the overall average being £15.65. The number of persons per house averaged 4.24.

District 2 contained thirty-two towns and villages with populations of from 110 (55 per sq. mile) to 1,663 (554 per sq. mile) and the number of dwelling houses and farms from 24 to 430 (12 to 143 per sq. mile), with average rateable values of from £10.5 to £16.55 (£11.7 overall), and 3.9 persons per house. Rateable value was assumed to be the most ready reliable guide to standard of living. Deducting farms and inaccessible cottages, the average rateable value in District 1 is £17.25 and in District 2 £12.875. Excluding cottage property (rated at £5) the average annual value is £18.95 and £15.25 in the respective districts, in both of which houses rated at from £6 to £12 represented more than fifty per cent. of the total number. The cottages had external dimensions of 130 sq. ft. per £ of r.v., houses with a r.v. of from £6 to £12 about 90 sq. ft., and above that from 53 to 89 sq. ft.

A further analysis of the purely domestic premises on the two-part tariff, with a full year's consumption, revealed three distinct classes of consumers :—

Price per kWh d.	kWh per £ of r.v.	Revenue per £ of r.v.	Revenue % of r.v.
7.35	7.56	4s. 7½d.	23.1
3.64	18.2	5s. 6d.	27.6
1.74	64.8	9s. 5d.	47.0

The average of the three classes is approximately 30 per cent. of the rateable value or 24 kWh per £ of rateable value at 3d. per kWh.

Accepting 20 per cent. of the rateable value (with £2 per annum as the minimum standing charge) plus 1d. per kWh as a reasonable two-part tariff for a rural area, broadly speaking, the average annual revenue per domestic consumer, excluding cottage property, will work out in practice to approximately one-third of the average rateable value.

Percentage of total consumers.	Annual revenue % of r.v.	kWh per £ of r.v.	Average price pence per kWh.
25	23.0	7.2	7.7
45	28.0	19.2	3.5
30	49.0	69.6	1.7

The overall average number of kWh per £ of r.v. may be put at 32 and the average price per kWh at 2.5d. About 25 per cent. of the total number of consumers will use electricity for lighting only; a large section—say 45 per cent.—in addition to lighting will use it for irons, kettles, and other domestic apparatus, such as toasters, percolators, hot plates, vacuum cleaners, etc., and occasional heating by means of bowl fires; the remaining 30 per cent. may be expected to make comparatively full use of electricity for all domestic purposes, including occasional radiators and small water heaters, together with cooking apparatus.

Examples of rural distribution work in the Chester area

A supply of electricity has been available for some years in several towns and villages, in both districts, from small plants consisting of oil or suction gas engines and batteries. The following table gives examples of these :—

Total No. of Premises.	Average r.v. £.	No. of Consumers.	Average Revenue £.	% of r.v.	kWh per Consumer.	d. per kWh.
373	28.00	265	5.87	21.0	245	5.76
617	12.50	175	4.125	33.0	125	7.9
244	10.50	120	4.05	38.5	106	9.15
166	11.50	70	3.4	32.4	82	10.0
55	10.00	26	2.65	26.5	71	9.0
63	13.50	25	3.92	29.0	79	12.0
51	11.25	21	4.0	35.5	118	8.15
40	16.75	10	5.3	31.65	106	12.0
30	17.50	20	5.1	29.15	125	9.8
	12.10		3.98	32.85	108	8.85

If the first example is omitted, electricity is used almost solely for lighting. The number of premises includes those classified as "other than domestic"; dwelling houses form 80 per cent. of the total and the average rateable value per connected domestic consumer is £15. The average revenue per domestic consumer is in the neighbourhood of 6.3 kWh per £ of r.v. or £3 10s. per annum, *i.e.*, about 23.3 per cent. of the average r.v.

A small-scale experiment in reducing tariffs gave the following encouraging results in the first example above :—

Tariff.	12d. per kWh.	12d. Lighting, 1½d. Power.	20% of r.v. and 1d. per kWh.
Average price per kWh.	12.2	5.2	3.15
Decrease per cent.	—	57.4	74.0
Units per £ of r.v.	3.102	9.2	19.72
Revenue per £ of r.v.	3/2	4/–	5/2
Increase per cent.	—	26.3	63.0
Revenue per cent. of r.v.	16.0	20.0	26.0

As the scope and penetration of electric service increase a higher average revenue than one-third of the rateable value may be attained. If this factor, one third of the rateable value, is applied to the two districts under review, the average annual revenue per consumer is, in District 1 £6 6s. 8d. (610 kWh per consumer), and in District 2 £5 1s. 8d. (448 kWh per consumer).

In general terms, the relative importance of each class of consumer as sources of revenue would be as set out in the following table :—

Average Rateable Value £.	(District 1.) Percentage of total Revenue.	(District 2.) Percentage of total Revenue.
5.0	2.85	7.6
10.5	28.5	43.7
18.5	20.1	18.1
26.5	12.55	9.1
36.0	8.75	4.0
46.0	5.5	3.5
55.5	5.55	3.5
73.0	4.1	4.6
115.0	12.1	5.9
	100.0%	100.0%

The average annual revenue per cottage consumer will probably not exceed £2 3s. 4d. or 10d. a week. Including cottage property, the average annual revenue per consumer is likely to fall to about £6 per annum in District 1 and to about £4 15s. in District 2.

AN interesting tour during which we saw the steps taken, not only to deal with present supply conditions but to facilitate the meeting of anticipated future demands, was recently made in the area supplied by the Metropolitan Electric Supply Co., Ltd., and its affiliated concerns, all generally known as "Metesco." From the broader aspect the point of outstanding interest lies in the diversity of the conditions and demands of supply—from dense city conditions and high-class residential areas to urban and suburban districts, and finally to rural neighbourhoods.

The companies are the authorised undertakers for the dense city office and industrial districts of Holborn and Paddington, as well as the rural towns to the west of London, such as Chesham, Sunbury, Acton, and Wickham.

The problems set have been, and are being, dealt with so that expansion can be carried out as a scientific development

Chenies village where every house is connected, making underground distribution commercially possible

designed to afford progress with economy, and without overlapping, in easy stages from densely loaded to lightly loaded areas. The initial systems of distribution have been adapted and brought up to date; as and when opportunities have arisen, districts have been entirely changed over to permit modern methods of distribution. About ten years ago "Metesco" adopted as standard for its densely loaded districts 1,250-kVA transformer banks (three-phase in three units). Now the standard is 3,000-kVA banks, and lately 6,000-kVA banks have been introduced.

The small-capacity banks were passed on, in turn, to such suburban areas as Acton and outlying districts such as Ironbridge. At Acton there are at present some 3,000-kVA banks which have done duty in the city area. The policy of replacing existing banks of primary transformers by ones of double the capacity and utilising the smaller sets in the less dense areas enables the company to use the extremely valuable space in its city area to the very best advantage.

At Fisher Street in the Holborn area we saw modern plant dealing with the l.p. d.c. system instituted some thirty-five years ago. It was originally supplied on the primary side at 10 kV, 60 cycles, and now it is served by a 22-kV, three-phase, 50-cycle system. To meet the heavy concentrated loads now encountered a three-phase, 6.6-kV system has been provided, serving a standard 230/400-V, four-wire, l.p. distribution scheme covering all the principal thoroughfares and generally supplied from underground sub-stations. Credit for the efficient results so obtained is due to Mr. W. J. Dawson, who has been responsible for the modernisation in the densely loaded areas.

The 6.6-kV supplies displace the old d.c. services where big building blocks are replacing smaller buildings, and a case was cited in which two h.p. inlets have replaced forty old d.c. services. Among the 18,000 kW of transformer equipment at Eagle Street sub-station (Holborn area) we saw a bank of three 1,000-kW, and another of three 2,000-kW transformers, each bank occupying about the same floor space, illustrating the advance in transformer design in about eight years. Eagle Street is one of the main 22-kV incoming points, and the switchgear is remotely controlled from the transformer and convertor sub-station at Fisher Street. The Eagle Street "sub" measures about 90 by 50 ft., and fan ventilation is employed, with ducts discharging on to each bank of transformers.

In a separate local sub-station within the larger structure we saw how the company is substituting circuit breakers for fuses for controlling main l.p. distributors. Smaller underground "subs" are generally ventilated by creating natural circulation, aided by dissipated heat from the transformers. About one square inch per kVA maximum installed capacity is generally allowed for the ventilating pipe section areas to keep within the necessary limits of temperature rise. The sub-stations at Holborn Vaults and Shaftesbury Avenue are two examples of modern construction—"Ferrocrete," with all iron work for cabling, &c., incorporated during construction, and with cable tubes equipped for plumbing cables thereto. The company realises the importance of not interfering with the original structure, so as to preserve water-tightness. These "subs" also show how the 6.6-kV supply is superimposed on the d.c. network. Holborn sub-station has 600 kW of transformers installed, and it measures 12 ft. by 10 ft., and the corresponding figures for Shaftesbury Avenue are 1,200 kVA and 16 ft. by 12 ft.

Sub-stations Large and Small

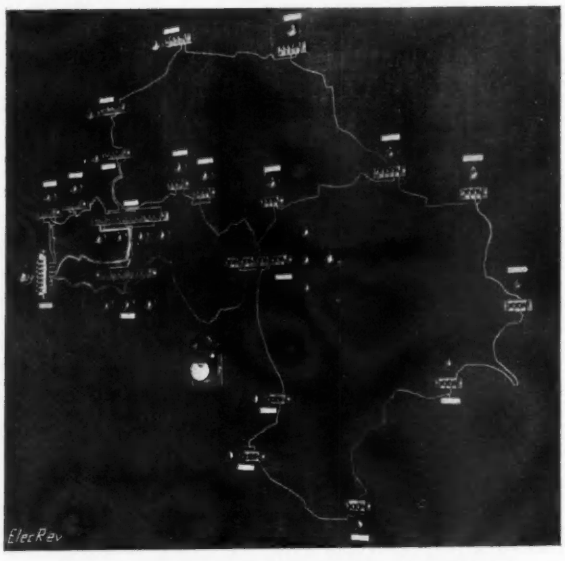
A sub-station under construction at Cable House, the new headquarters of Cables & Wireless, Ltd., is a fair example of a sub-station on a large consumer's premises, but not every one of such sub-stations is quite so roomy. Its transformer capacity is 1,200 kVA. There is a.c. only in the Paddington area, and the old three-wire single-phase secondary system was served by a two-phase primary system. This explains the Scott-connected transformers at Brook Mews North, where the conversion from 1,000 V to 6,000 V for the primary distribution has resulted in a very considerable saving in transformer

A l.p. line on a new housing estate

capacity. This is one of the many mews in the district converted to sub-stations and there are about twenty outgoing l.p. feeders. It makes an interesting comparison with the latest "subs," such as Shaftesbury Avenue, &c., which are put

directly at the load centres. The Hereford Road (Bayswater) pit is still more modern, and it cost about £2 per kVA to build and equip. There are 600 kVA of transformers in it, and it measures 12 ft. by 12 ft. The ventilation ducts embodied in the structure have openings immediately beneath the transformers and are of very ingenious design.

In the more open neighbourhood at Brentford we saw a typical above-ground brick "sub" at Power Road. A feature



Electrical replica of the 22-kV system at Ironbridge

of its equipment is a truck-type switch unit with wing isolators which can be replaced by switches to meet future demands. This structure measures 12 ft. 6 in. by 8 ft. (standard), and it has the double-wall inlet and roof outlet ventilation feature to which we referred in our description of the Lynton Road (Acton) glass-bulb rectifier sub-station in our issue of February 17th (p. 240). Lynton Road, by the way, is remotely controlled from Southfield Road sub-station, where we saw the special arrangements designed "to get the plant away" smoothly on load. Its ingenuity lies in its simplicity—a step-by-step sequence through resistances.

Ironbridge, the distribution centre for the 22-kV system, under the control of Mr. J. G. Bell, is situated at about the load centre. Here we made an interesting comparison between cubicle work with bare-copper overhead connections and direct transformer connections with cables into bell boxes. But what most attracted our attention was an electrical replica of the main transmission system, from which practical results bearing on volt-drop, impedances, &c., can be obtained. It is actually to scale, and its great value lies in the accuracy with which actual rupturing capacities, &c., can be calculated from it. We saw at this centre a testing van equipped with valve apparatus for d.c. pressure testing up to 50,000 V, as well as equipment for both h.p. and l.p. fault location. Because the van is at the disposal of any department, there is no excuse for any cable or joint not being tested after installation.

In the Country

At Chesham we saw how the company supplies the outlying districts in bulk. The 2,500-kVA group of small single-phase transformers in the old sub-station, and the 2,500-kVA unit-type transformers, with automatic voltage regulation, in the new "sub," are evidence of growth. The dimensions of the old and new "subs" are 33 ft. by 18 ft., and 24 ft. by 18 ft. respectively. In the Chesham district, where there is a good deal of overhead equipment, we saw a development of the Aylesbury pole. Bushes are taken right through the pole. Inspection of the general 6.6-kV overhead-line construction was afforded us at Latimer, where the line from the Chesham sub-station to the Northern and Western parts of the Chesham area runs. It is a simple wood-pole line with pin insulators arranged triangularly on metal or wood arms. For rural and semi-rural areas "Metesco" evidently believes in the outdoor sub-station, and that at Wells House Road is an example of the development scheme which it has in hand. The construction is simple, consisting of suitable terminal and control gear, transformers, and switchgear compactly arranged.

Our description of Lynton Road explains the company's policy with regard to meeting increased d.c. demands in outlying areas. We understand that a similar sub-station is projected for the Acton area, and that it will follow the lines adopted for the "subs" in the denser districts in that it will be situated at the load centre and will be of the underground type.

We are indebted to Major Richardson, managing director of the Metropolitan Company, for his courtesy in extending to us facilities for inspecting and photographing the equipment and collecting information, and to Messrs. W. H. Chapman and H. P. Rowles for a most informative journey over an area of about 400 sq. miles. Finally, we should specially mention Mr. Swan, of the Chesham Company, whose overhead work so well "melts" into its surroundings that the most æsthetic of critics could hardly find ground for objection.

Insulating Tape Production. By F. A. Middleton

Rubber and rubberless types

A LARGE array of ingredients, of which rubber is the base, is available for providing an adhesive surface for insulating tape. They are all commonly used in other branches of rubber manufacture, and the actual proportions in which they are incorporated with the rubber can only be decided by experience, for the art of compounding for this class of product is an empirical one.

Various low-grade rubbers are used (with the exception of the variety known as "Dead Borneo," which leads to brittleness and loss of adhesiveness) to the extent of between 25 and 30 per cent., in conjunction with something like 40 per cent. of hard resinous substances, which have the characteristic of imparting a high degree of softness and tackiness to rubber, and suitable amounts of pine tar, liquid asphalt, and other fatty and oily substances. As with all rubber mixings, the compound may be cheapened by the addition of fillers, such as whiting, talc, barytes, and so forth, but these must be used sparingly to avoid the risk of the adhesive becoming dry and cracking. Two methods exist for rendering the compound suitable for surfacing the fabric (which, incidentally, is usually unbleached calico, and is processed in one continuous width), but a greater diversity of processes are available for applying the gum. Of these, the system known as "spreading" is probably most common, at least in England.

Rubber is soluble in a number of liquids, such as carbon disulphide, carbon tetrachloride, naphtha, benzene, and petroleum spirit, and among these the last three are exploited commercially for depositing rubber upon and within the interstices of fabrics. A viscous homogeneous mass—the "dough"—is made by dissolving rubber in limited quantities of the solvent (usually naphtha in England, and benzene or petrol in America), and the spreading process is acomplished with the aid of rollers and an adjustable scraping-knife. A hood surmounts the machine with the object of collecting the evaporated solvent for its recovery and subsequent re-utilisation. In modern installations, activated carbon is the adsorbing medium for the solvent vapour, and some 90 per cent. of solvent can be recovered with its aid.

Rubber Mixing Methods

Dissolving, or, more accurately, dispersing, rubber in these liquids is not so simple as ordinary methods of solution. Before it will go properly into solution, rubber must be thoroughly masticated between the rollers of a mill. The ingredients may then be worked into it, and finally the solvent added in small quantities until a suitable consistency has been attained. As the mastication of rubber generates considerable heat, this has become known as the "hot process," in contradistinction to the "cold process," which consists in allowing already masticated gum to soak in benzene for twenty-four hours, during which time the rubber swells until a homogeneous mass is produced. The adhesion-promoting ingredients are then incorporated while the rubber is in the masticating machine.

The disadvantage of the cold process is exhibited during the spreading operation. Whereas the fabric coated with hot-mixed gum can be dried rapidly enough to make covering both sides possible in a continuous manner, the rubber dough produced in the alternative way dries much more slowly, and the fabric cannot be rolled up immediately. This drawback nullifies its slight advantage in permitting lower proportions of raw rubber to be used. The apparently lower rate of solvent evaporation in the cold process is due to the greater proportion of liquid required for soaking the rubber than when reducing the hot compound of gum, tar, resin, &c., to a suitably viscous state.

Two further processes are commonly used which employ the calender. In one of these, a solution is prepared in either of the ways described above, and pressed into the cloth as it passes between the cold bowls of this machine. Alternatively, the rubber mix is prepared without recourse to a solvent, and "frictioned" into the fabric at a higher temperature. This frictioning consists in rotating the calender bowl which carries the gum to the fabric at a greater speed than the bowl around which the fabric travels, so that the rubber is forced into the cloth by the consequent wiping action.

Cutting the Strips

Whatever method is employed, the cutting into strips is performed subsequently to the rubberising process. Formerly, rolls of friction tape were produced by rewinding the coated fabric into a roll of the desired diameter on a paper core, and slicing it into sections on a lathe by pressing a sharp-pointed knife through both material and core. An operative's indolence or lack of skill could then cause trouble, for edges that have become firmly adhered become torn and frayed upon unwinding. It is now the practice to draw the uncut fabric over a hardened steel roller as it is unwound, and to subject it to the pressure of semi-sharp cutting wheels spaced according to the width of tape desired.

Non-rubber Tapes

Since most of the adhesive properties are derived from the added materials insulating tapes can be made without the aid of rubber, which introduces a more or less complicated series of expensive machine processes. A light fabric is drawn back and forth through a heated solution of asphalt, resins, pine tar, and various oils, until it is thoroughly impregnated. To secure even dispersion, and for convenience, lengths of only ten or fifteen yards are taken, and the solution is kept agitated to prevent the formation of oil globules.

After saturation, the lengths of cloth are pressed between two iron rollers, and dried in a stream of air, finally to be cut into strips. The process of manufacture is not continuous, as in the case of rubber-spread goods, and it is doubtful if the method, even from the strictly production aspect, has a great deal to recommend it. For electrical purposes the rubberised tape is superior because a thicker deposit is obtainable, enhancing the already greater degree of insulation resulting from the use of rubber.

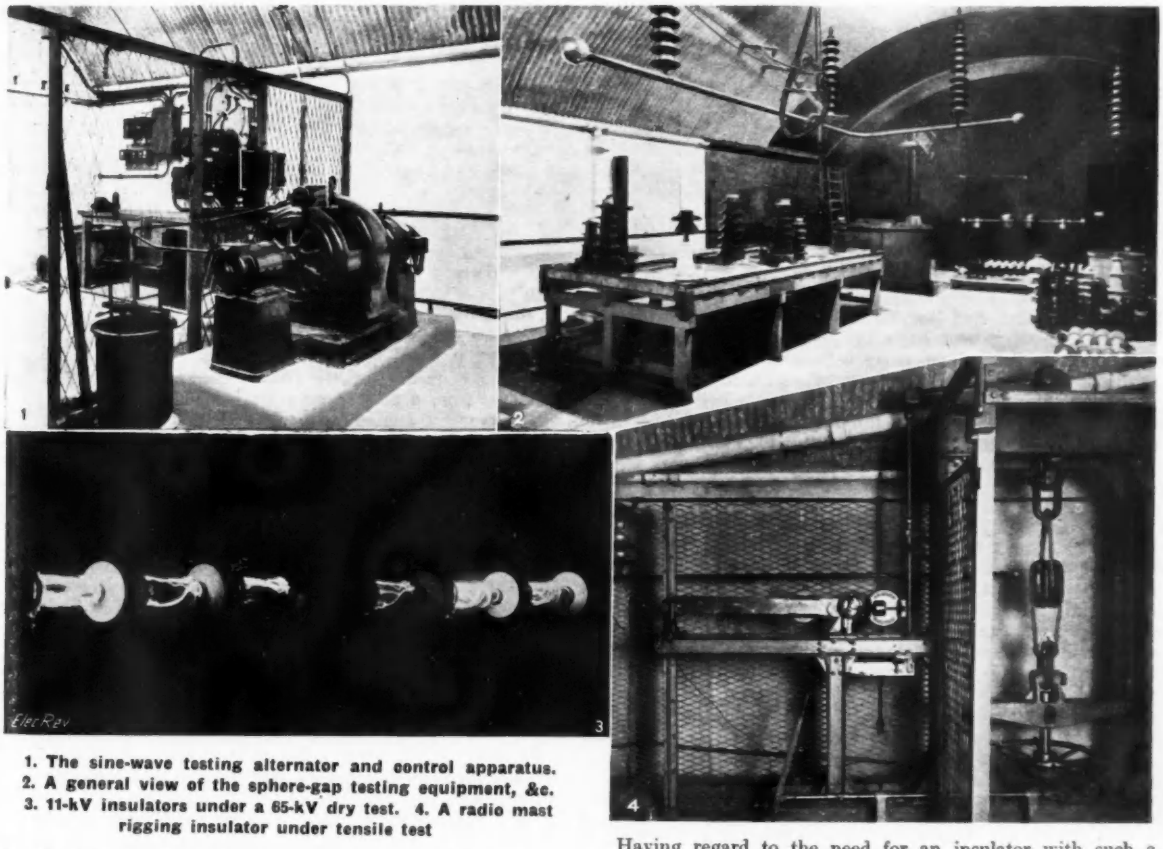
High Voltage Insulators

TO meet an increased demand for their e.h.p. porcelain insulators, and to comply with the appropriate British Standard Specifications, Messrs. Doulton & Co., Ltd., have recently established at their Lambeth works new insulator electrical and mechanical testing plant.

The equipment comprises a 250-kV, 60-kVA single-phase testing transformer fed by a pure sine wave alternator of 20-kVA normal output at 50 cycles per second. Voltage regulation is effected by potentiometer control of the alternator field fed by a directly coupled exciter. A separate 250-mm. diameter sphere gap is employed for the accurate determination of the voltage and calibration of the voltmeter, which is connected across the input terminals of the transformer and scaled in kV.

An Avery tensile testing machine is also installed for determining certain mechanical characteristics of particular types of insulators. A feature of the plant generally is its portability. The contract for the whole of the electrical equipment was given to the British Electric Transformer Co., Ltd.

The company has recently patented a 132-kV suspension disc insulator for grid overhead lines, and this type of insulator will shortly be exhaustively tested prior to its being placed on the market. Another of the company's recent developments is an extra large radio mast rigging insulator for employment in connection with B.B.C. transmitting station towers. It is shown in the illustration of the test machine. The company's opinion is that this type of insulator has been subjected to the greatest known mechanical compression load; it is capable of withstanding a pressure of 50 tons without breakdown.



1. The sine-wave testing alternator and control apparatus. 2. A general view of the sphere-gap testing equipment, &c. 3. 11-kV insulators under a 65-kV dry test. 4. A radio mast rigging insulator under tensile test

Having regard to the need for an insulator with such a characteristic, the organisation, after much research to obtain the necessary insulating and mechanical properties, supplied such insulators in bulk for B.B.C. towers at Moorside Edge (Huddersfield), Falkirk and Watchet. The insulator measures 12 in. long and 8 in. overall diameter, and it is suitably fluted for protection against electrical creepage.

It was interesting to learn from Mr. F. A. Hill, sales engineer, to whom we are indebted for showing us the testing plant and for assistance in preparing these notes, that in spite of trade depression in the industry the turnover of insulators by the company last year was higher than that of the preceding year.

Ships' Electric Cables. By John Dummelow, M.A. (Cantab.)

THE use of electric cables on board ship is governed by the I.E.E. Regulations for the Electrical Equipment of Ships, second edition, June, 1926, as amended in July, 1929, and also by the recommendations of Lloyd's Committee. Experience shows that the chief factors contributing to marine cable failures are vibration, mechanical damage, extremes of temperature, and the presence of water, salt, or oil in the atmosphere or surroundings. Any of these influences can be counteracted by suitable protective covering and insulation.

During the last few years changes in the design of ships and their propulsion machinery have tended to increase vibration in proximity to the engine room and also the stresses due to the "working" of the hull when the ship is under way in heavy seas. Vibration is particularly insistent at points where the cables pass through bulkheads or to and from girders, and it is at such places that trouble is most likely to occur. The best method of protection is to enclose the conductors in a metal sheathing. Unfortunately, soft metals such as lead are particularly liable to "fatigue cracking" from inter-crystalline breakdown caused by alternating stresses that may be much smaller than the normal breaking load of the material. The cracking of pure lead sheathing has been one of the most serious difficulties encountered in the past, so much so that to-day pure lead is generally replaced by a tin, antimony, or other alloy. Such a sheathing considerably increases the resistance to fatigue, and is the most satisfactory protection against vibration and also contamination from liquid oil or brine; it is, of course, unaffected by an atmosphere charged with moisture (such as in cold storage chambers) or oil fumes.

Further protection against vibration can be afforded by laying a cotton braiding, compounded, over the sheathing to act as a cushion between the latter and the fixing clips, and where vibration is both serious and persistent or mechanical damage is likely, a still heavier covering such as galvanised wire armouring is necessary. This not only protects the cable from abrasion but also helps to absorb longitudinal strains due to the motion of the ship. Whichever type of protection is adopted, a further cotton braiding should be applied overall and, like all braiding used on board ship, must be thoroughly impregnated with a fire-resisting compound.

Earthing Requirements

A metal-alloy sheathing, if properly installed and bonded to earth, gives ample protection against corrosion. In this connection it should be noted that the amended I.E.E. Regulation No. 73 states that "every lead-covered cable and every armoured cable shall have its lead covering and/or armouring efficiently earthed at both ends, except in the case of such cables forming final sub-circuits which shall be earthed at the supply end only."

The temperature and humidity of the atmosphere have a considerable influence on cable life. Recent advances in the use of high-pressure steam make high ambient temperatures inevitable in and near the engine-room, and for service in the tropics it is also necessary to provide against a hot and often humid atmosphere throughout the ship. The insulation used for this purpose may be of either varnished cambric, impregnated paper, or rubber. In oil-laden atmospheres and high temperatures the ends of ordinary rubber insulation tend to deteriorate rapidly, and varnished cambric is preferable.

In electrically propelled ships power is generally transmitted to the propeller motors by varnished-cambric or paper-insulated cable. Varnished cambric is less hygroscopic than paper and is well able to stand the high ambient temperatures below deck. It is also very suitable for short runs of cable where space limitations make it inconvenient or impossible to install sealing end boxes, as, unless the situation is excessively damp, it is only necessary to finish off the cable with varnished tape followed by an insulating tape of good quality. The insulation usually consists of a high grade cotton fabric varnished with a mixture of pure boiled linseed oil and a bituminous substance.

If propulsion cables are to be heavily loaded it is often easier to install a number of three-core cables in parallel than a group of single-core cables with very heavy conductors; each conductor is braided, the phase being indicated by a distinctive colour, and all three cores are then wormed circular, metal sheathed, and braided overall. In the turbo-electric liner *Queen of Bermuda* the propulsion cable consisted of three tinned copper conductors of 0.45 sq. in. cross section. The ends were taken to terminal boxes arranged in two groups of three, placed one in front of the other and supported by hardwood cleats fixed to the ship's structure. In passing through watertight bulkheads packing glands of non-ferrous metal were used to ensure watertight connection between the compartments.

Heavy-current Cables

For transmitting power to electrical auxiliaries in merchant ships, either varnished cambric, paper, or rubber insulation should be chosen, according to the load carried. On low-voltage ring mains (including the connections to the branch circuit-breakers) in large vessels, very heavy currents have to be carried. Consequently cables with impregnated paper insulation are usually preferred to rubber on the score of economy, the higher carrying capacity allowing a smaller conductor (up to 2 sq. in. cross section) to be used.

For the wiring of the various electrical installations rubber insulated cables are generally used. In a typical specification the insulation consists of two layers of vulcanised india-rubber, designed to withstand widely divergent atmospheres and climates, and to resist the high ambient temperatures found in confined parts of the ship. The composition of the rubber follows the Admiralty specification, and the thickness is suitable for working pressures up to 250 V in conformity with the appropriate British Standard Specification. The insulated core is covered with a lapping of cloth tape, made waterproof with rubber solution. Where several conductors are included in the cable they are distinguished by the covering tapes, which are either of different colours or are marked with different numbers.

In spite of recent disasters there should be no danger of fire whatever from a modern electrical installation on board ship if it is properly carried out and wired in accordance with the I.E.E. Regulations.

The Japanese Electric Power Industry

JAPAN is largely mountainous and has a rainfall uniformly distributed in dependable quantities, so that the construction of hydro-electric power plant has been a natural part of the general growth of the electrical industry. Large reservoirs are exceptional, so that steam plant has been brought into use around the large consuming centres. The Government study of 1912 showed that at a time of minimum flow there was available potential power of 5,018,000 kW. The average over a six-months period was 9,848,000 kW, and there were 2,500 sites commercially worth development.

Of 1,700 plants in the country, about 400 are operated by power companies for the exclusive sale of electricity. The remainder take part in railway developments and various industrial undertakings. The Financial and Economic Annual of Japan for 1931, issued by the Department of Finance, records that the capacity of power plant in Japan amounted to 4,193,623 kW, of which 3,188,452 kW was for electric and railway company plant and 1,005,171 kW for individual and industrial companies. The total power generated in 1929 by all public utility companies, including railways, amounted to 13,312,000,000 kWh, of which 1,766,000,000 kWh was produced by small, isolated, or individual plant.

In Hokkaido, the northern island, there are seventeen hydro-electric and four steam plants, with one hydro-electric plant under construction. In the northern part of the main island of Honshu there are thirty-three hydro-electric, four steam plants with three hydro-electric, and one steam plant under construction. In central Honshu, near the large industrial centres round Tokyo and Osaka, there are 143 hydro-electric and thirty-six steam plants, with thirty-three hydro-electric and three steam plants under construction. In southern Honshu, west of Osaka, and including the island of Shikoku, twenty-four hydro-electric and twenty-five steam plants are in operation, and three hydro-electric plants in course of construction. In the southern island of Kyushu thirty-two hydro-electric and eleven steam plants are in operation, and one steam and two hydro-electric plants are in course of construction. The whole of Japan proper, therefore, has a total of 249 hydro-electric and eighty steam plants in operation, with forty-two hydro-electric and five steam plants being constructed.

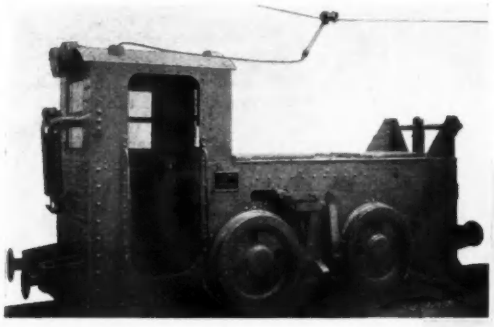
The cost of electricity in the country varies greatly; recent trends, however, are downward. Competition has been acute, the reason being the overlapping and duplication of services between the large companies. Attempts are being made to arrange agreements between large companies to put an end to expensive competition and to bring about mergers, interconnection, and more uniform price rates.

Pulverised coal is playing an important part as fuel for new plant. A survey made by the Government ten years ago showed that the cost of steam-generated power was from 20 to 30 per cent. larger than that of hydro-electric power. It must be borne in mind, however, that at that time the cost of coal was considerably higher than it is at present. Steam plant, however, still operates under a handicap, owing to transportation costs.

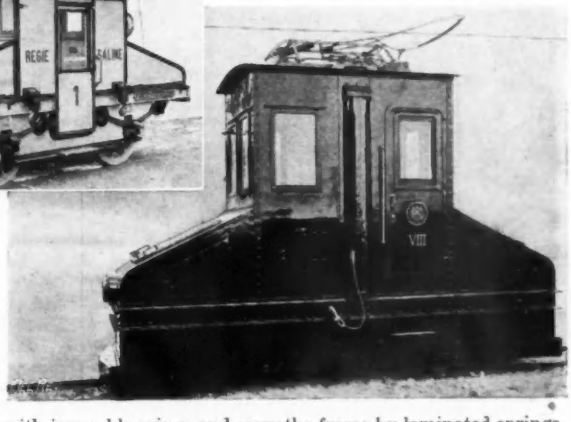
Electric Canal Haulage. By R. Hedley

Some interesting Continental schemes

ONE of the latest Continental canal electrification schemes is that of the Oise-Aisne canal with its ramifications into the Sarre coalfields and to the Rhine port of Strasbourg. The railway is of the metre gauge and is equipped with a 600-V d.c. overhead trolley line. The four-wheeled tractors which have a driver's cab at one end, are driven through a double-reduction gear with ratios of 101 : 13 and 51 : 13 by "Alsthom" air-cooled traction motors, developing 12.5 h.p. at the one-hour rating (10 h.p. continuous). The draw-bar pulls corresponding to the principal speeds of 1.9, 2.625 and 7.5 m.p.h. amount respectively to 1,430, 1,100 and 550 lb. The two axles are chain coupled as is usual for this class of locomotive



Three examples of canal-haulage locomotives. Left: on the Oise-Aisne Canal; centre: At Cagliari, Sardinia; right: The tall locomotive used on the Niederfinow Canal



in order to protect the driver from possible injuries when walking by the side of the tractor. The principal dimensions are: driving-wheel diameter, 2 ft. 4⅜ in.; wheelbase, 3 ft. (approx.); length over body, 14 ft.; width, 3 ft. 8¾ in.; height to cab roof, 6 ft.; weight, 5 tons.

Current is collected from the trolley wire by a pair of deeply grooved pulleys arranged in tandem in a small carriage; a piece of tubing projecting downwards from the latter is connected by a special coupling to the flexible cable which leads into the driver's cab. The draw hook for the reception of the hawser cable is in duplicate, one at either end of the locomotive; its shank passes centrally through a strong helical spring and is guided between a pair of shears. The guide plate is secured by a nut screwed on to the threaded end of the draw-hook shank; a grooved pulley fixed between the upper, open end of the shears is free to travel along a stout round iron bar placed transversely across the width of the locomotive, at a height of about 5 ft. from the top of the rails. The bar at the front end is fixed to a pair of angle plates projecting above the corners formed by the side and end walls, the other bar being fastened to the cab structure. The semi-enclosed cab contains all controls within easy reach of the driver. The box-type frame is built up from plates and rolled sections and has large openings at the top to give easy access to the power unit, and the transmission and auxiliary gear.

A number of these locomotives has recently been supplied to the Office National de la Navigation, of Paris, by the Société Alsacienne de Constructions Mécaniques.

A German System

A metre-gauge railway has been constructed on either side of the Niederfinow locks of the Berlin-Stettin ship canal. The Siemens-Schuckert four-wheeled tractors are operated by 500-V single-phase energy supplied from the power station at Heegermuehle, near Eberswalde, and are each equipped with a pair of 4.5-h.p., 500-r.p.m., axle-hung, single-phase commutator (repulsion) motors. The drive is through double-reduction gear giving a speed of about 1.8 m.p.h. at full load, and 5.6 m.p.h. at light load.

Speed regulation and reversal are effected by displacing the brushes from zero position. Although the rigid wheelbase of the locomotives measures 6 ft. 7 in., curves of 50 ft. radius are negotiated without difficulty. The tractors weigh 12 tons and develop a normal draw-bar pull of from 1,300 to 2,600 lb. with an overload capacity of 25 per cent.

The 330-ft. hawser reaches the winch by way of a pulley fixed to a small carriage, which moves up or down and is guided by a pair of vertical rails which form a pillar carrying a ball bearing at each end and are free to rotate around the vertical axis. The carriage can be raised or lowered by means of a hand wheel fitted in the cab, with a corresponding variation in the height of the hawser, thus enabling the latter to pass clear of barges moored along the side of the canal. The winch drum receiving the hawser is driven by a 4.5-h.p. single-phase commutator motor through a single-reduction gear. A friction clutch disconnects the motor from the winch if the pull of the hawser exceeds 3,300 lb., and a centrifugal governor prevents the motor from racing if the cable fails.

An electro-magnetically operated strap brake holds the winding drum fast after the motor has been switched off. The hawser is coiled on to the winding drum in even layers, and a spring-loaded block prevents the spontaneous uncoiling of the cable if the pull diminishes. A small transformer supplies 120-V current to the head, tail and cab lights. The brakes are hand-operated.

The track is built almost entirely of flat-bottomed rails weighing 40 lb. per yd. and laid on fir sleepers spaced at about 32 in.; grooved rails are used only on one bridge serving the public traffic.

Locomotives in Sardinia

An electric canal locomotive supplied by the Oerlikon Works to the Régie Saline of Cagliari (Sardinia) is built to the metre gauge. It is driven through double-reduction gear by a standard 33-h.p. (one-hour rating), 500-V traction motor, spring-supported from the frame. The chassis is constructed of rolled-steel sections and plates. The axle-boxes are fitted with journal bearings and carry the frame by laminated springs.

The centre portion of the foot-plate is occupied by the totally enclosed driver's cab; this is of the well type which permits a considerable reduction in the maximum height of the locomotive. A spring-loaded single trolley arm is mounted on the roof of the cab. The speed-regulating rheostats and other auxiliary equipment are housed in sheet-metal structures sloping from the cab towards the ends of the locomotive.

A tractive effort of up to 5,000 lb. is developed and five loaded barges can be hauled at 2.5 m.p.h. The principal dimensions are: length over headstocks, 15 ft. 9 in.; maximum width, 5 ft. 8 in.; height to top of cab roof, 6 ft. 7 in.; diameter of driving wheels, 2 ft. 8 in.; wheelbase, 6 ft.; the weight is five tons.

A Cable-drum Carrier

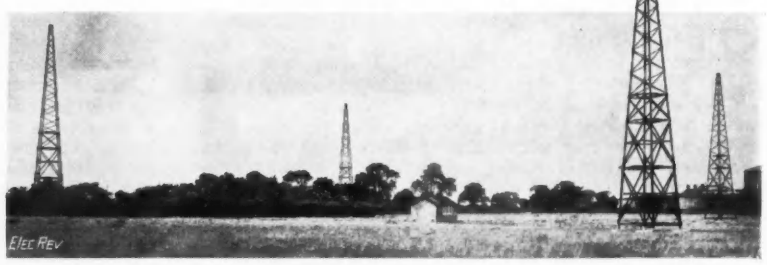
A SPECIAL four-wheel trailer has been built by Henry Boys and Son, of Pleck, Walsall, for the Midland Electric Corporation for Power Distribution, Ltd., for the transport of cable drums and of machinery up to a weight of six tons. The chassis comprises four main longitudinal members, two on each side, one above the other. Fitted in between the upper and lower members are two half-elliptic springs on each side, which carry the two cranked axles. The outer ends of the springs are pivoted to the frame while the inner ends are shackled to a balance beam designed to allow one wheel to rise as much as 9 in. above the other when surmounting an obstacle. This keeps the platform level when the vehicle is travelling over irregular surfaces and provides a simple means of tipping the platform through a small angle to facilitate loading and unloading. A screw-type jack is fitted at the front enabling that end of the trailer to be lifted. The tailboard can be dropped to form a ramp up which a cable drum can be rolled on to the platform either by hand or by a hand-winch fitted at the front of the trailer; sufficient loading space is available to allow a second drum to be pulled on to the platform after the first is in position. The four wheels which have pneumatic tyres are provided with 15-in. internal-expanding brakes. The platform is 12 ft. long and 5 ft. 6 in. wide, and the overall width is 7 ft. 8 in.

Direction-finding at Night

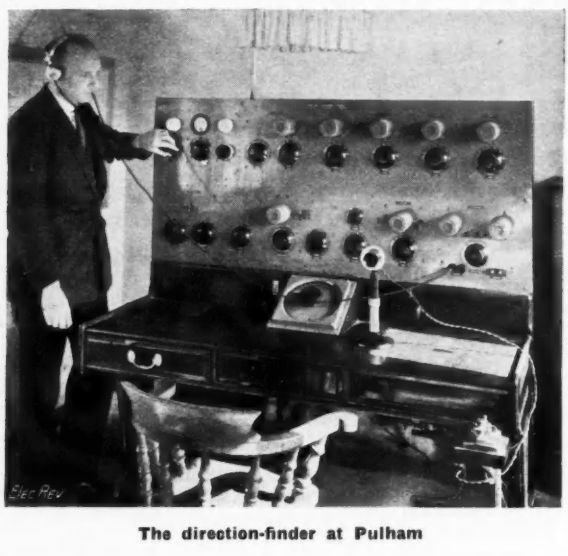
WIRELESS direction-finding has so frequently demonstrated its value to aircraft that certain definite limitations to which it is subject in its present conventional form are comparatively little realised, particularly as they only apply during the hours of darkness. These limitations are inherent in the design of the normal type of equipment.

The "night-effect" is due to the fact that to obtain accurate bearings on a direction-finder employing a loop aerial two conditions are essential: First, that the path of the radiation between the transmitting station and the direction finder must follow the great circle between those points; and, secondly, that the radiation must be normally polarised—that is, with the electrical component vertical to, and the magnetic component parallel to, the earth's surface. The first condition is always fulfilled on wavelengths above about 100 metres, but the second is only realised when the path between the transmitter and direction finder is entirely in daylight. During other periods the radiation may be "bent" when it reaches the aerial and thus create a false reading by its action upon the horizontal members of the loops.

By using the Marconi-Adcock aerial system, in which not only are the top horizontal members of the loop eliminated but the bottom horizontal members are completely screened and non-receptive, none but the normally polarised energy is received, all the active components of the aerial being vertical. The aerial system consists of four vertical wires suspended within lattice-wood towers erected at the corners of a square, at the centre of which are situated the receiver and radiogoniometer. The bottom end of each aerial wire is connected to the radiogoniometer by a feeder conductor fitted concentrically inside, and air-insulated from, an outer earthed metallic covering. A self-supporting aerial about 10ft. high erected at the centre of the system can be used for determining the "sense" of the transmitting station.



The layout of the Pulham installation



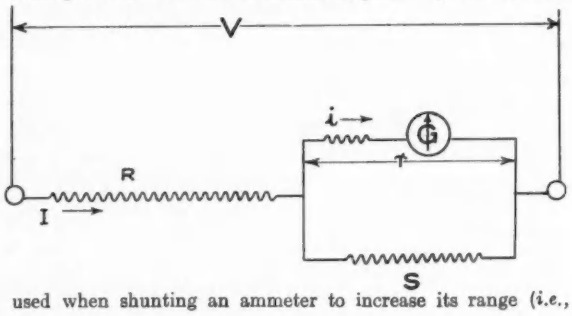
The direction-finder at Pulham

The receiving apparatus, which embodies the radiogoniometer in its construction, has its various components mounted behind vertical panels carrying the necessary controls, and the panels are carried on a self-supporting frame with a conveniently arranged operating desk. The whole of the receiver is very carefully screened, each stage in the circuit being completely enclosed in an earthed metallic cover and all interconnecting wires being individually screened by copper braiding. Four tuned stages of screen-grid high-frequency amplification are followed by a detector valve and two stages of low-frequency amplification. Two other valves are employed respectively as a local heterodyne generator and as a coupling valve for the central "sense" aerial. The tuning controls are all directly calibrated in metres and are separately adjustable. By special ganging mechanism they can all be swung in unison over a band of wavelengths on each side of their individual settings, enabling quick "searching" to be carried out.

The first installation of this type was supplied by the Marconi Company for the Air Ministry direction-finding station at Pulham, Norfolk, and recent orders include a similar equipment for Pulham's sister station at Lympne, Sussex. The Swiss air authorities have also just ordered a Marconi-Adcock direction finder for the aerodrome at Dubendorff, near Zurich, and several similar instruments are in course of shipment to the Near East. Both short and medium wave-ranges are covered by the various models of these instruments, the standard wave-ranges being 10-100 metres, 500-1,000 metres, and 800-1,800 metres.

Pressure-circuit Multipliers

RECENTLY I had occasion to calculate a considerable number of multipliers for wattmeter pressure circuits and voltmeters. It was not permissible, owing to the high sensitivity of the movements, to obtain multiplying factors by adding resistance. The resistance required by the formula



used when shunting an ammeter to increase its range (*i.e.*, $\frac{1}{M-1} \times$ ammeter resistance, where M is the multiplying factor of the shunt) would have been too large to be accommodated. The only course was to shunt the moving coil, which, for this purpose, had added to it a certain amount of resistance in order to make it up to a convenient value.

The circuit diagram represents either a dynamometer wattmeter pressure coil circuit or a d.c. (D'Arsonval) voltmeter. The problem was to obtain a general formula so that a quick calculation of the shunt value s could be made, having given the multiplying factor (M) required.

Referring to the diagram,

$$I = \frac{V}{R + \frac{rS}{r+S}} \quad \text{and} \quad i = I\frac{S}{r+S} = \frac{V}{R + \frac{rS}{r+S}}\left(\frac{S}{r+S}\right)$$

Then for the same voltage applied to the potential terminals the moving coil current will be $\frac{1}{M}$ of the original current value.

$$\frac{V}{R + \frac{rS}{r+S}} \times \frac{S}{r+S} = \frac{V}{M(R+r)} \qquad S = \frac{Rr + RS + rS}{M(r+R)}$$

$$\therefore S = \frac{Rr}{R+r} \times \frac{1}{M-1}$$

Expressed in words: We apply the same multiplying formula as we use for ammeters to the resistances comprising the portions of the voltmeter circuit considered as being in parallel. If R is very large compared with r then the formula for ammeters can be applied to the moving coil portion r alone. It was the necessity of taking account of the change in the total circuit resistance, however, which led to the working out of a simple and accurate formula.—F. L. BEST.

Lighting a Large Area

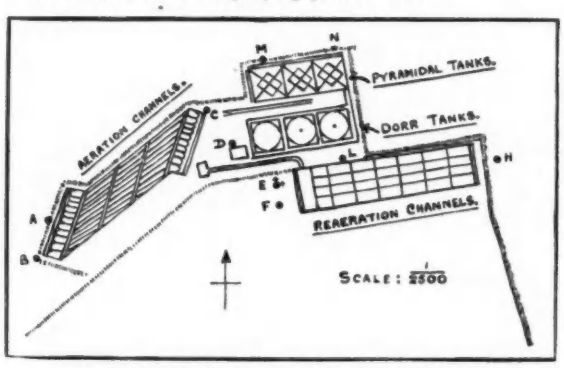
How night supervision at a London sewage works is facilitated

THE artificial illumination of the Northern Sewage Outfall Works of the London County Council at Beckton is a very good example of the floodlighting of large outdoor areas for a utilitarian purpose. Sewage work proceeds uninterruptedly day and night, and involves the visual observation of aeration ebullition, the control of levels, and flow through orifices and along channels, while the footways are of necessity narrow and sometimes precarious. Therefore, during the hours of darkness artificial illumination must simulate daylight with sufficiently even intensity to avoid the risk of accidents being caused by passing out of bright spots into dimly lighted areas. It is also essential to avoid glare, to use the economic minimum number of poles and fittings, and to place the lamps as far away from the water surfaces as possible.

Two views of the Northern Sewage Outfall Works, depicting the even nature of the illumination

After due consideration of all relevant aspects of the case, it was concluded that "Blaizolite" projector lanterns mounted on appropriately tall standards would most probably satisfy the requirements. The scheme prepared by the L.C.C. Electrical Division, in collaboration with Messrs. Baxter & Caunter, Ltd., consisted in the erection of ten standards (one of which carries two projectors E mounted at right angles to each other) spaced as shown in the accompanying ground plan.

Thus the aeration channels area, which is 360 ft. long by 80 ft. wide, and the pyramidal and Dorr tanks area, which is 200 ft. square, are each lighted by four 1,000-W projectors, A B C D E L M N, placed one at each corner. The reaeration channels area, which is 360 ft. long by 80 ft. wide, is provided with two 1,000-W projectors E F at one end and one of 1,500 W H at the other. Careful adjustment of the projector mirrors has produced very even illumination over the whole area, as the accompanying pictures show.



Plan showing the arrangement of the projectors

The projectors are mounted on 57-ft. tubular steel poles, which are strapped to the foundations of the tanks and channels and embedded in 17 ft. of concrete. The mounting height of the lamps is thus 40 ft. above the plane of illumination. The shapes of the areas to be lighted and the nature of the ground, which was either existing covered sewage channels or recently made-up banking, prohibited the choice of lighting units requiring uniform spacing. Some idea of the difficulties encountered on this marshy site may be formed from the fact that it was necessary to mount two of the poles in 17-ft. concrete drums, around which sewage flows. The constructional work was carried out by Messrs. Harland & Wolff, Ltd., of North Woolwich.

The 1,000-W lamps are controlled in pairs from the pump house, but in addition each is provided with a switch and fuse mounted on the pole, so that any lantern can be made "dead" should repairs at night become necessary. To facilitate cleaning and maintenance a "safety" platform has been erected immediately beneath each lamp, which is reached by means of a steel ladder. Owing to the exposed position and the constant effect of effluent gases, the projector lanterns were treated with anti-sulphuric enamel, and "Duroray" reflectors were incorporated for the mirrors.

The installation was put into operation in April, 1932, and after twelve months' service it is reported that there is no sign of deterioration or corrosion, and the interiors of the projector lanterns are in good condition, and show no defects arising from the atmospheric conditions or the sewage gases. During recent tests readings of from 0.4 to 0.5 foot-candle were obtained over the whole area illuminated. The installation has proved itself to be "eminently satisfactory," and it is stated that the cost of maintenance has been confined to lamp replacements.

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Kitchen Gardening by Electricity

IN the "Bulletin d'Information et de Propagande concernant les Applications d'Electricité et de Perfectionnement de l'Eclairage," M. Damesne, of the Fontainebleau Gas and Electricity Co., gives some particulars of experiments which have recently been made in kitchen gardens with the use of electricity for the growing of early vegetables in place of the usual heating by manure. On the bed a layer of cinders was well beaten in and covered by several layers of sand. On this was laid in a wavy form two parallel lead-sheathed conductors connected up to the junction boxes whence the power was drawn, these being covered with a final 12 in. layer of mould. As is customary, the bed was surrounded by boarding on which glass frames were laid. Three-phase current at 220 V was passed through the conductors, the power transmitted being 5 kW (between 75 and 76 W per sq. yard). The power was used only during the night and was switched on and off by means of a clock. During the test a temperature on the top of the soil of from 59 to 64 deg. F. was attained, and a total of about 1,000 kWh of electricity was required to get a crop of excellent cabbages in the short space of twenty-five days.

The results with electric heating are said to have been very satisfactory and to show a marked economy over manuring when the cost of the manure, its transport, and handling are taken into account, the comparison being favoured by the low rates at which electric power can be obtained during the night. Even if the costs had been the same, it is claimed that electricity would be the more advantageous form of cultivation, requiring less labour: moreover, the cost of manure is likely to increase owing to its growing scarcity.

MEETINGS AND DISCUSSIONS

Current Topics and Opinions Expressed at the Institutions

The Heating of Lamps and Fittings

FOLLOWING Mr. H. G. Taylor's summary of the Electrical Research Association's paper (to which reference was made last week) at the INSTITUTION OF ELECTRICAL ENGINEERS in London on April 20th, Mr. W. Lethersich gave a striking demonstration of the heating effects described by means of a cinematograph film and also experimentally by the ingenious Schlieren method.

Mr. Ll. B. Atkinson opened the discussion by remarking that the demand for a flexible connector was the root of the problem. The use of a rigid connector would obviate the difficulty. Some new insulating material, more suitable than those at present available to cable makers, might be discovered in future, but it was the business of fittings and lamp makers so to modify their designs as to permit rubber-covered flex to be safely employed, rather than to blame cable makers who had no suitable materials available for use. The I.E.E. Wiring Rules recognised two grades of insulation, but the higher grade was very seldom used because it was considered ugly and more difficult to introduce into fittings on account of the larger diameter of the wire. Asbestos and similar coverings had disadvantages, as they were thicker, stiffer (not really flexible), and should only be used in really dry situations.

Mr. C. C. Paterson thought it was hardly fair to throw the onus on to fittings manufacturers. The temperatures reached were not inevitable; they could be reduced, but would they be reduced sufficiently? There would probably be as much difficulty in selecting new materials for lamp caps and holders as there would be in finding new insulation for cables. The paper was merely the commencement; manufacturers must now take up the practical aspect of the subject. Mr. F. C. Raphael asked if this was not a cable makers' problem, whose was it? He predicted that in twelve months' time he would be offered cable with better heat resisting qualities. When that was obtainable there would be no need to apply any of the other remedies, of which the authors had probably suggested too many. The problem did not stop at lighting fittings, for domestic flat irons and many other devices suffered in a similar way.

Prevention Better than Cure

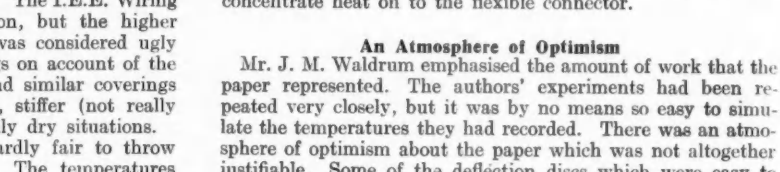
Mr. E. B. Hunter said that this problem had worried him considerably. In shop and showcase lighting particularly there was urgent need for heat reduction. Architects had experimented with different insulation materials in multiple stores and had found that asbestos covering did not give a sufficiently good insulation test, even in dry positions. Mr. E. Leete considered that prevention of heat formation would be better than its deflection. Similar asbestos covered flexes to those found suitable for dry situations in Canada and the United States could be used in this country too.

Mr. W. J. Jones implied that the subject had been magnified out of all proportion in the case of normal small domestic lamps, but it should certainly receive due consideration where large lamps were concerned. They must preserve the "flexibility" of electric lighting and not hamper or restrict architects in their designs. He asked for information about the temperatures reached in fittings attached direct to walls and ceilings, as distinct from pendants. Mr. H. Long stated that compounded felted asbestos flexes were more promising than some people seemed to think. The continued use of variants of the conical type of lamp shade was a reflection on the industry.

Mr. A. Cunningham, speaking as a railway engineer, said that the conditions revealed by the paper were very serious from the maintenance point of view, and any sort of guidance was welcome. In large installations, blocks of offices, etc., where many pendants were used, even 40- and 60-W lamps could not be neglected as Mr. Jones seemed to suggest. So-called heat-resisting flexes only deferred the trouble, as they, too, ultimately became brittle, especially if moved or disturbed. The best solution of the problem would be to abolish pendants altogether, and use more built-in fittings. If pendants were required they could be wired with v.i.r. cable enclosed in a slender tube. The tendency was already in that direction. Mr. C. E. Sayer pointed out that the transmission of heat through screw caps was much greater than that through the bayonet type. There was some confusion between fire (external) and heat (internal) resisting cables and wires. Home Office lampholder shields were almost perfectly designed to concentrate heat on to the flexible connector.

An Atmosphere of Optimism

Mr. J. M. Waldrum emphasised the amount of work that the paper represented. The authors' experiments had been repeated very closely, but it was by no means so easy to simulate the temperatures they had recorded. There was an atmosphere of optimism about the paper which was not altogether justifiable. Some of the deflection discs which were easy to apply in the laboratory where conditions were controllable might not be so useful in domestic practice where draughts were unavoidable and the air was continually moving. Some of the apparently easy modifications suggested as the result of laboratory tests might be extremely difficult to incorporate in practice. Lampholder cord grips differed in length and temperatures should therefore be measured relative to the holder rather than the flex, *i.e.*, nearest to the point at which the conductors could make contact.



Messrs. W. Lethersich, P. D. Morgan, and H. G. Taylor, the joint authors of the I.E.E. paper on the heating of lamp fittings

Mr. P. D. Morgan, in reply, characterised the paper as a good example of what could be achieved by co-operative research. The problem was an old one, which had remained unsolved for so long because the people concerned could not come together. The research worker had indicated how the trouble was caused and how it might be minimised. It was now the industrial designer's job to decide which of the suggested remedies should be adopted and how best they could be incorporated in present designs. Some manufacturers were already working on those lines. The deflection disc was not pretty, but they had to offer some cheap and simple method capable of application to a type of fitting of which very large numbers were in everyday use. They had tried not to over-emphasise trouble and danger, but no good would result from under-estimating them.

How Can Tariffs be Simplified?

WHAT tariff will best satisfy consumer and supplier? The short paper by Mr. Theodore Stevens which was read at the monthly meeting of the OVERHEAD LINES ASSOCIATION in London on April 19th shows that in 245 places a flat rate of from 1s. to 7d. per kWh is charged for lighting, and that in over 400 places the flat rate is below 7d. For consumers of electricity for lighting only 7d. to 8d. is low enough, the author thinks, especially where no minimum charge is made. In one area in which there are 10,000 meters 20 per cent. registered less than 20 kWh in any quarter; such consumers are a burden to the supplier. In the twelve annual reports of the Electricity Commissioners 326 applications for revision of statutory maximum charges are recorded, 243 being for increases and 83 for reductions. Applications for reductions are often made without examination of precedents or prospect of success, and inquiries involve considerable expense and time. Two-part tariffs are not statutory. Can they not be legalised? Actual and suggested methods of assessment are referred to and the results of practice quoted. There are areas where conditions demand better terms than those which exist at present.

Mr. A. Lennox Stanton, president, opened the discussion by remarking that of the total energy sold 2,744 million kWh, or 30.2 per cent., represented domestic supply, and this section of supply provided more than 58 per cent. of the total revenue. It was therefore apparent that the establishment of

conditions which would increase the value of "derived utility" in the domestic sections was an important element.

When Does the Peak Occur?

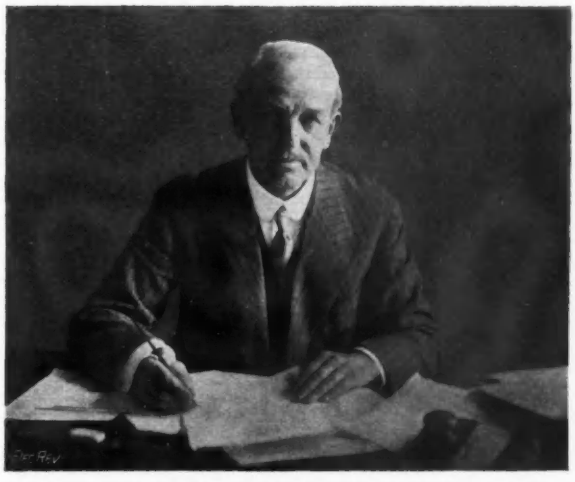
Mr. H. Wilson, in a communication, stated that probably the fairest way of assessing a standard fixed charge would be to take into account the whole of the apparatus installed and to build up a standing charge of so much per kW for lighting, cooking, heating, &c., allowing for the high diversity factor of uses other than lighting. He believed some authorities were charging on such a system. All present systems seemed to be based on the assumption that the peak load of the undertaking would always come in the evening, and that therefore cooking, heating, &c., could be regarded as a sort of by-product. Any undertaking reducing the running charge to ½d. per kWh would, he believed, find in a year or so that the peak load would occur at about 8.30 on a winter morning, and in that event the cheap rates which had been cultivated would no longer be remunerative, except that when such a time arrived the load factor would have so much improved that the situation might right itself. Another matter to be guarded against was offering a low flat rate for lighting without any guarantee of consumption.

Mr. W. A. Turnbull (Aylesbury) said that the rateable value system encouraged consumers to economise. He had adopted the base area system, which was reported upon favourably by the committee appointed by the Electricity Commissioners. Houses of the same kind in different parts of a rural area were assessed at different rateable values. Small users did not represent a dead loss to an undertaking. The occupiers of cottages could not afford the wiring, but the electrical undertaking should hire it, even though perhaps the revenue from some of the cottages would not be more than 30s. per annum, which was all he received from quite a number of them. Rebates for quantities should not exceed 5 per cent. Mr. C. F. Mounsdon agreed with the criticism of the Nuneaton sliding scale block tariff as not being conducive to the sale of electricity. There had been a great outcry for simplicity, but he maintained that it could be overdone. By adopting a double-basis tariff a supply company was able to reduce its average fixed charges 15 or 20 per cent. below the fixed charges which would have to be made if a single-basis tariff were adopted. The only equitable two-part tariff that could be offered to shopkeepers was one based either on the lamps connected or the maximum demand, which was practically the same thing.

Cheaper Electricity for Rural Residents

Mr. R. J. Swan (past-president) agreed that a double-basis tariff was essential. His undertaking's standing charge was 13s. per room in houses of a rateable value of up to £20, the charge per room increasing as rateable value increased, so that it was equitable for all classes of consumer. The rooms in a big house might not be numerous, but they would be large, and therefore the consumer living in such a house paid more per room. In addition, there was a running charge of ¾d. per kWh. One distinct advantage of this tariff was that consumers in rural areas were paying less than those in the urban areas; rural consumers should not be penalised because they lived a mile or two away. The industrial tariff of a fixed charge per kVA, plus ¾d. per kWh, had worked quite well when the factories were working eight hours per day regularly, but when they were working short time the average cost of the electricity used was higher, and consumers were dissatisfied.

Mr. W. H. Cooke (Luton) suggested that if costs of supply were reduced to as low a figure as possible, and electricity was supplied at a little less than those costs, invariably the consumption increased so much that the supply costs automatically fell further and a profit was earned. He agreed that rural districts ought to be supplied more cheaply than urban districts. He could not see any true relationship between rateable value or floor space and lighting. He provided domestic supplies through prepayment meters simply because the consumers had not the money to pay quarterly, there being a flat rate of about 4½d. per kWh for lighting, and a supply at ½d. per kWh through a separate meter for heating, cooking, or other domestic apparatus.



Sir Frank Smith, F.R.S., who was to deliver the Kelvin Lecture on "The Travel of Wireless Waves" at the I.E.E. yesterday (Thursday) evening

Mr. F. E. Rowland said that the "lamps installed" basis of standing charge was sound, but suggested that the tariff might be framed in a different manner so that the consumer did not feel that he was paying for lamps installed. Mr. R. B. Matthews, in a communication, said that farm motors were not all in use at one time; hence any rate based on installed horse-power must be avoided. There was no objection to the maximum demand system, for if a farm were well engineered none of the motors need exceed 5 h.p. except for electric ploughing.

Mr. Stevens, in reply, said that he did not suggest that rateable value was a better gauge of consumption than the floor area, but it was a gauge of the size of a house, which was assessed by an independent authority, and cost nothing to get. What could be done to cheapen electricity and at the same time avoid ruining income? The only suggestion he could make was a graded discount.

Switch or Fuse for High-voltage Circuits?

THE high-voltage circuit breaker and its competitor, the high-voltage fuse, form the subject of the paper by Mr. W. D. D. Fenton which was read before the London Students' Section of the Institution of Electrical Engineers on April 21st. The author points out that with the growth of rural distribution, it has been found necessary to consider the fuse as a real alternative to the oil circuit breaker, owing chiefly to the high capital cost of the latter.

Circuit breakers are stable against momentary overloads, but fuses are not generally so. They can be equipped with directional and minimum time-graded protection and can therefore be adapted for use in complicated as well as simple transmission networks. Fuses are non-directional and the time interval between the blowing of fuses of different ratings in series is a variable factor which is reduced almost to zero when the fault current is large, unless the difference in rating between the fuses is great. The field of the fuse lies in the protection of short feeders radiating from a central point or the protection of small branch lines or small transformer tapping points.

A combination of fuses and circuit breakers offers an effective and economical system, but a reasonable degree of security is also possible by an intelligent use of fuses only. At important distributing attended sub-stations the remote electrically operated circuit breaker has no equal. The rupturing capacity of circuit breakers for the grid is 1,500,000 kVA. Tests on 132-kV fuses have been made recently and a short-circuit kVA of over 900,000 was cleared rapidly and effectively; 11-kV fuses are designed to deal with a fault of 100,000 kVA. A good design of fuse clears a fault more rapidly than a circuit breaker.

The capital cost of a circuit breaker is far in excess of that of a fuse equipment for similar duty; fuse renewals cost about 6 per cent. per annum of the total capital outlay.

Two cinematographic films taken during tests on 132-kV fuses were shown at the meeting.

* * *

Harnessing Natural Steam

A paper of unusual interest upon a subject of which few people have any experience in this country will be delivered before the Royal Society of Arts, London, on May 3rd by Senatore Prince Ginori Conti. Geysers and fumaroles, or steam springs, have been harnessed so that the steam issuing from the ground under a high pressure is used to develop electrical energy on a scale which, now that experience has been gained, is likely to make a substantial contribution to the electrical development of Italy. The steam contains boric acid and also rare gases, and an industry has been developed round the blow-holes to win these products also. The whole is a remarkable achievement, due very largely to the courage and energy displayed by the lecturer, whose paper on "The Natural Steam Springs of Tuscany and their Industrial Application" will deal with the historical development of the venture and describe it as it exists to-day as a going concern. Electrical engineers as well as chemists will be interested to learn how the many difficulties have been overcome in harnessing this new and unusual source of power.

Correspondence

Correspondents should forward their communications as early as possible. No letter can be published unless we have the writer's name and address in our possession

Two Tramway Points

I should like to comment on two items of tramway interest which have recently appeared in your "Traction" notes. The first item relates to the speed limits theoretically in force on the London tramways, and the second to the abandonment of certain tram routes in Leeds.

Speeds, both average and maximum, are, in practice, higher on the London tramways than on any other urban tramways in the country, as, in spite of the "limits" of 16 and 20 m.p.h., the cars quite usually travel at from 25 to 30 m.p.h. The L.C.C., apparently, is seeking to obtain legal permission to run at speeds which have been common for the last five or six years, although at present illegal. This shows the absolute rectitude of the tramway man's conscience—but it would rather complicate the position if the request were refused and the authorities, being now informed of the actual speeds run, sought strictly to enforce the 16-20 m.p.h. limits!

In view of the blind hostility to tramways, I think that the L.C.C. would have been well advised to let sleeping dogs

An unusual design of reinforced-concrete lighting standard at Enfield West station

lie. In a way, the tram's reputation for slowness was an advantage, since the authorities never thought it worth while to take any notice, no matter how high the speed actually was; while, with the public, the higher the speed the better.

With regard to the tramway abandonments at Leeds, it must be remembered that, with one exception (a long route, but carrying a relatively infrequent service), the routes abandoned are only short spur lines. Several hundred new cars of the latest design have recently been placed in service in Leeds, and certain short-track extensions are also contemplated. I do not think that the abandonments at all affect the reputation of Leeds as a tramway stronghold.

A. G. FitzGerald, Graduate, Inst. Transport.

London, N.10, *April 22nd.*

The Altrincham Railway

The only point for approval in the electrification of the Altrincham Railway that I can find is the adoption of 1,500-V d.c., and that is only a half-measure. Why not run two convertors in series, 1,500-0-1,500-V, and reduce the copper to half the sectional area or double the distance between the points of production?

With the two-in-series method there would be two separate supplies, and a breakdown of one would still leave the other available for temporary measures, pending the arrival of portable auxiliary plant during repairs. Also, the current for 1,500-0-1,500 V would be only 0.333 A per kW, and would afford much easier collection. The working difficulties of the overhead construction appear to be much overrated, due probably to the fact that the ordinary tram and bus trolley wheel having been found sufficient for its purpose, research in connection with the collection of larger currents has been very slight.

Considering that the ponderous locomotive is responsible for the larger proportion of the permanent way cost, and also the evil effects of vibration, it has always been a matter of surprise to me that the electrification of our lines has been so long delayed. Where economy demands it, there should be legislation for making suitable improvements in procedure compulsory.

The absurd and wasteful central-station system, with its radiating feeders, diminishing as the distance increases, should have been abolished many years ago in favour of multiplied points of production, feeding into a network of two-in-series concentric conductors, with the outer earthed continually. This would eliminate all stray currents and their effects.

London, S.E.12, *April 17th.* E. G. Pink.

The Electrical Association for Women

If my letter in your issue of April 7th was "a general and rather confused statement," how could it call for a lengthy reply from the Director of the E.A.W.? The Director suggests that members should in future forward their complaints to the Committee and give full information of "facts" before disapproving of methods and procedure.

I must reiterate the fact that £5 would have been needed from my own pocket to attend the function in London to which I referred; expenses of this nature are not being paid by several electricity supply authorities in depressed areas, and rightly so. Miss Haslett evades my query as to how many undertakings in the North can be said to give assistance in the training of local girls as demonstrators. She boasts of the well-attended functions, balls, dinners, &c., but may I ask how many of the potential hired wiring consumers attend such meetings. I am asked if I suggest an itinerant clubroom on the lines of an electrical demonstration caravan. This had not occurred to me, but I now suggest that it might be the means of cutting down the travelling expenses of officials of the Association to the dinners so frequently attended.

I have occasion to meet all classes of potential consumers of electricity, but find that the person upon whom the electrical industry is relying can ill-afford to mix up with "fur coat consumers." Other associations can assist such consumers in these depressed times. I look forward to the views of other members who have prompted me to refer to the Association's methods.

Member.

April 18th.

Electric Brakes for Cranes

Referring to Mr. Tupholme's article in your issue of April 14th, the main disadvantage of the series type of brake for crane work is that its coil has to carry the heavy current rushes which occur at starting. On a busy crane this involves a solenoid of larger dimensions than that necessary to deal only with lifting the brake, if undue heating is to be avoided, and space is an important factor on most cranes, quite apart from the additional cost.

The dangerous sluggish action with shunt brakes can be reduced to negligible dimensions by employing a shunt brake, designed as such, with the minimum of working parts, to reduce friction and lost motion, and having demagnetising washers or screws, between the armature or plunger and the yoke. In special circumstances, it may sometimes be desirable to arrange the controller to disconnect the brake from the rest of the circuit in the "off" position.

This company, among others, markets a range of such brakes, with shunt, series, and a.c. coils, as required. These brakes are compact, self-contained units, and, as they are capable of operating in any position, can be applied to cranes, or almost any other moving machinery. The old arrangement of strap iron, toggles, levers, and separate solenoids is rapidly becoming a relic of the "dark ages."

Marryat & Scott, Ltd.,

London, E.C.1, *April 20th.* L. J. Gooch.

Canvassers and Canvassing

With reference to points raised by "Electrical Engineer" in your last issue, surely the test of salesmanship is the ability to sell one's own services against severe competition, without recourse to "cut-rate" methods. "Electrical Engineer's" complaint as to the non-response of employers to an advertisement in the technical Press, whether of the "agency" type or otherwise, is certainly justified, the writer and others having had similar experiences. An employer will rarely consult such a list should a vacancy arise. Provided he has no protégé for whom he has to find a position, he will advertise the job himself, or look through his file of past applications for employment, pick out a fairly suitable man who seems to have experience of the exact work in hand, and appoint him to save the cost and trouble of an advertisement.

Therefore from a "sales-psychology" point of view one

ought (1) to become a protégé of as many "captains of industry" as are likely to have vacancies to offer; (2) have an application on the files of each of these gentlemen. The impossibility of making such personal contact rules out the first alternative, and the second can be reduced to that phrase so dear to salesmen—sales campaign!

A really telling circular letter—in advertising parlance "good copy"—to several hundred firms of the type in which he is interested, designed to arouse interest in the personality of the writer, together with curiosity to see the "goods" (*i.e.*, himself—the employer in this case being the customer) briefly outlining his capabilities in as many directions as possible, and above all avoiding obvious overstatements, ought to have results in the future.

In the present, No! for no firm is philanthropic enough to create a vacancy, however promising or original the candidate.

The curious thing about all this is that if one does obtain a position by a campaign of this kind and thus proves one's own "selling ability," the lucky employer will usually turn round and frown upon any such exhibition of originality applied to his business. This is partly because he has failed to recognise the campaign in its true form, but mostly, I am afraid, because of sheer prejudice against any kind of originality as being revolutionary.

This appears to apply more particularly to the supply industry, and is possibly due to our chief engineers and managers being so intent upon reducing the price of the unit by intensive technical research, as to have no time to devote to selling it! It is almost enough to make one turn renegade and apply to Sir William Crawford and Sir David Milne-Watson for appreciation. I would mention that this letter is not *intentionally* humorous, and sign myself as one who has suffered for

April 23rd. ORIGINAL SIN.

Power Station Efficiency

Belated though this letter may be, it may, nevertheless, usefully draw attention to an important aspect of the discussion at the I.E.E. on the paper entitled "The Present Practical Limits of Power Station Thermal Efficiency," by Mr. W. S. Burge. I refer to the constructive submissions of Mr. I. V. Robinson and Mr. C. Verity urging the rational necessity of adopting the Darrieus definition of steam turbine thermodynamic efficiency, with which I am in complete agreement.

I would suggest the time has arrived when consideration of turbine efficiencies should be entirely in terms of the Darrieus concept, and I believe this view to be shared by many eminent turbine designers, including Guy and Baumann. Is it possible to secure unanimity among all those who are associated with turbine efficiency determination with a view to more general adoption of the method?

London, W.3, *April 18th.* S. B. JACKSON.

Automatic Fire Alarms

Your correspondent who talks of 150 deg. in fire detection is up to the top line of optimism, for at that temperature he has a furnace positively raging. To be successful a fire alarm must indicate a rise of temperature that is in any way abnormal, say, a quick rise of 20 deg., and at the same time not be too sensitive and subject to false alarms.

This can only be done by having the instrument made up of specially selected metals with every part carefully studied for its behaviour to be sure that it will be constantly active, and in no case should it be destroyed or melted up after a fire—it must be good for all time. Then you have the right article.

I have gone into these questions with the object of marketing such an article, and although I have dozens of models which I claim to be improvements on the Walters instrument, I feel that I could not confidently put mine on the market and face the world. One requires a good price for the service that a real fire alarm will give because it must be reliable, unbreakable, dust-proof, and not subject to failure.

Brentford, Mx., *April 24th.* E. M. BLAGBROUGH.

The Design of Permanent Magnets

I am obliged to Prof. Howe for drawing attention to a simple alternative method of deriving the magnetic potential across the gap of a permanent magnet. Prof. Howe, however, admits that his method involves the conception of negative permeability. His method equally well involves the conception of infinite permeability when the magnetising force has been reduced to zero, and of zero permeability when the magnetising force is equal to the coercive force. Such conceptions, from the standpoint of the student, lead to endless trouble. For instance, when a lecturer is expatiating upon the remarkable permeability of 120,000 for permalloy, the student may point out that cast iron can have an infinite permeability.

I suggest that the single term "permeability," if it is to have any meaning at all, should apply only to the values of B/H obtained with complete reversals of the magnetising current and with the iron in a steady cyclic condition.

EDWARD HUGHES.

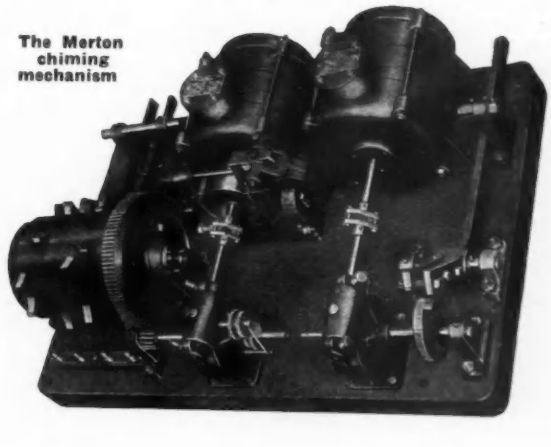
Technical College, Brighton, *April 24th.*

The main Berkhamsted h.p. line of the Metropolitan Electric Supply Co., Ltd. **(See page 589)**

The Bells of Merton

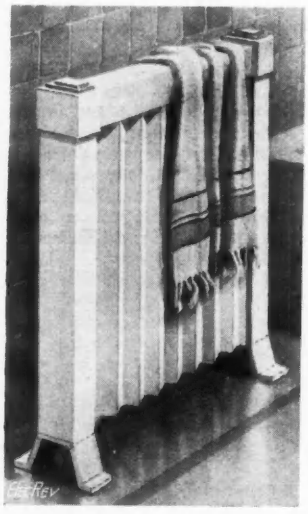
Merton is the oldest college at Oxford, and its bells date from, at the latest, 1288; they were recast into the present E flat octave in 1681. They are now, at the suggestion of Mr. F. Hope-Jones, to be used to chime "Canterbury" quarters and strike the hours recorded on the 5-ft. dial of the quadrangle clock, the hands of which are now driven by an electrical impulse dial movement from a "Synchronome" master clock in the porter's lodge. In this system the only necessary association between the clock and the bells, which are some distance apart, is an electric circuit. The accompanying illustration shows the chiming and striking gear. The right-hand ¾-h.p. motor strikes the hours on the great tenor bell and the other the four quarters. The chimes are based upon the eighth Gregorian tone, and their adoption symbolises the close historical association between Merton and Canterbury.

The Merton chiming mechanism



New Apparatus and Devices

for Domestic, Cooking and Heating, Lighting, Power and Scientific Purposes



Berry's electric towel warmer

An Attractive Towel Heater

A towel heater of artistic design, made by MESSRS. BERRY'S ELECTRIC, LTD., 85, Newman Street, W.1, has recently made its début. It is priced at £4 19s. 6d., finished in chromium plate, and the heating element has a loading of 300 W. The construction is of rustless metal throughout. The same type of apparatus can also be supplied with loadings up to 1 kW for use as a convection heater. Other finishes are available—nickel plate costing 7s. less and coloured enamel 10s. 6d. more. The measurements are 34 in. high, by 25 in. wide by 7 in. deep (floor measurement). Although intended primarily for bathrooms, the design lends itself well to other positions.

Illuminated Guard Posts

In view of the rapidly growing demand for illuminated guard posts for island refuges in roadways, the GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, W.C.2, has developed a new type of luminous pillar. It is 4 ft. high, and the light from a 60-W lamp is reflected from a number of tiered cast-iron surfaces finished in white vitreous enamel.

The pillar itself is of heavy gauge steel tube with an extended root entering the ground a distance of 2½ ft.; in the base is a door which gives access to a time switch and the fuses. The use of steel for the tube makes damage unlikely in the event of a smash, the only parts liable to breakage being the iron reflecting surfaces, which can easily be replaced as separate units.

The head of the post is arranged as a lantern with a red glass fixed around half its circumference. This red glass is fitted directly in front of the lamp, but where authorities consider it necessary to have two lamps on circuit in case one fails, provision can be made for an auxiliary lamp.

The G.E.C. illuminated guard post

As the steel tube forms a solid back, only that half of the pillar which faces the traffic is illuminated.

An All-insulated Switch-fuse

A new 30-A all-insulated switch-fuse sent to us by MESSRS. S. BILL & CO., LTD., Queen's Road, Aston, Birmingham, has a case made of walnut-finished "Bakelite" which not only gives it a pleasing appearance but makes it perfectly safe under all conditions and easy to handle owing to its light weight which is about three-and-a-half pounds.

This 30-A "Insulok" switch-fuse has the switch lever interlocked with the cover, and there are no exposed metal parts passing through the case. The cover is hinged at the bottom and is fitted with a fastening nut with a milled edge.

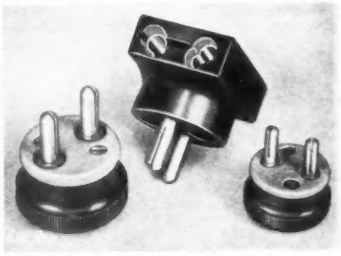
The switch movement is not new, the well tried "Botrade Q" design being employed. Ample room is allowed for the incoming and outgoing cables and owing to the special brush bar construction all wiring passages are clear and unobstructed. A simple sealing device is arranged on the cover fastener, and the size is 7⅞ in. long by 7¼ in. wide by 3¾ in. deep.

The "Insulok" 30-A all-insulated switch-fuse

The above remarks apply to the new 30-A "Insulok" switch-splitter, priced at 15s. 8d., as well as to the switch-fuse, which costs 12s. 4d.

A "Five-Fifteen" Multi-way Plug Adaptor

The latest addition to the range of "Lektrik" accessories is a novel multi-way plug-adaptor known as the "Five-Fifteen." It takes its supply from a 15-A socket *via* its own two 15-A plugs. The two central sockets on the top of the adaptor are also of 15-A size, but both 5- or 15-A plugs can be fitted into both the side sockets owing to the provision of a "double socket."

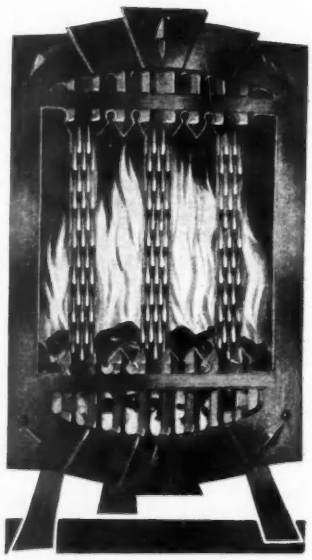


The new "Lektrik" adaptor

The body part of the adaptor consists of a solid moulding formed from one piece of brown "Bakelite," and it can be used with both side and front entry switch plugs. The catalogue number of this accessory is E.19620 and the price is 35s. a dozen; it is obtainable from MESSRS. A. P. LUNDBERG & SONS, 477/489, Liverpool Road, Holloway, N.7.

Another Artic Fire

As a modification of the Artic "Flame-Fire" a new 2-kW model has been introduced called the "Coal Flame Fire" and priced at 79s. 6d. It embodies a burning coal effect, which can be switched on independently of the element, and measures 24½ in. high by 14½ in. wide. The manufacturers are the ARTIC FUSE & ELECTRICAL MANUFACTURING CO., LTD., Birtley, Co. Durham.



The Artic "Coal Flame Fire"

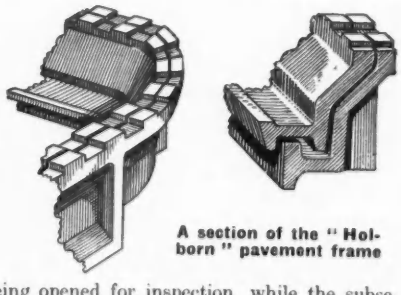
A Safety Electric Blanket

The "Sunbeam" safety electric blanket is a new product of the SUNBEAM VACUUM CLEANER CO., LTD., 28, Shepperton Road, Islington, N.1. It is priced at 24s. 9d. and can be set for three temperatures—100, 140 and 170 deg. F. Two temperature regulators together with a fuse are incorporated.

Pavement Frames and Covers

A new range of "Holborn" pavement frames and covers manufactured by MESSRS. W. T. HENLEY'S TELEGRAPH WORKS CO., LTD., Holborn Viaduct, E.C.1, possess several interesting constructional features combined with a neatness of design which make them particularly unobtrusive. The serrated edges are of the narrowest permissible dimensions, thus minimising the possibility of accidents to pedestrians through slipping.

The accompanying line sketches illustrate the inclined section of the joint which prevents trouble due to dirt and foreign matter wedging up the joint. Consequently the cover can be readily removed whenever the pit is being opened for inspection, while the subsequent operation of replacing the cover is facilitated by the combined location and pinch bar slot. The corners are rounded giving added strength and eliminating the danger of breakage in transit and handling.



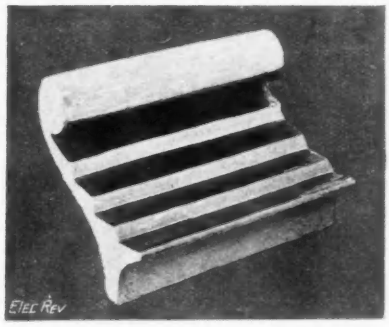
A section of the "Holborn" pavement frame

Cast-iron name plates can be fitted either with the standard lettering "Electricity Supply," or with special lettering,

monogram, coat of arms, &c. Lifting keys are obtainable and eight different sizes are available with the daylight area of the frames ranging from 12 in. square to 30 in. square.

A Cord Suspender for Irons

We recently inspected a new cord suspender and table clamp which the EDISON SWAN ELECTRIC CO., LTD., 123, Queen Victoria Street, E.C.4, is now supplying with its 15s. 6d. iron. The flex is threaded through a spring, one end of which is connected to a table clamp and the other to the iron connector, so that when the iron is pushed backwards and forwards the spring expands and contracts, leaving no loose flex lying on the table. The cord suspender is obtainable separately for 2s. 6d. complete with clamp.



An unusual design of fire produced by Messrs. R. M. Catterson-Smith, Adam Bridge Works, Exhibition Grounds, Wembley, at 45s. The 1-kW element is concealed in the "hood" and the glow is reflected on to the steps below

An Electric Waffle Mould

The new "Scotoid" electric waffle mould enables waffles 4 in. square to be produced at the rate of one every three or four minutes. The loading of the element is 500 W and the size is 6 in. square by 5 in. high, while the weight is 4¾ lb. It is available in several colour finishes and the element and grid covers are nickel plated. The grids are aluminium and the elements are guaranteed for five years.

The "Scotoid" waffle mould

With two yards of flex fitted with a combined wall plug and lamp-holder adoptor the price is 25s. The manufacturers are the SCOTOID CO., LTD., Bowyer Street, Birmingham.

Flame-resisting Flexible Tubing

MESSRS. SPICERS, LTD., 19, New Bridge Street, E.C.4, are marketing flexible tubing which has the customary cotton base treated with a special fireproof lacquer which will resist a naked flame longer than the usual varnish—ten seconds is claimed by the makers.

The tube is available in sizes with from 1 mm. to 20 mm. bores in 3 ft. lengths. The dielectric strength is in no way impaired by the lacquer.

A New Plug

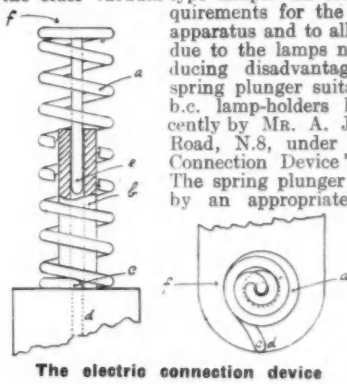
Among the accessories recently introduced by MESSRS. J. H. TUCKER & CO., LTD., King's Road, Tyseley, near Birmingham, is a 5-A 2-pin plug in moulded "Telacite." The outstanding features of design are the simplicity of the cord grip and the easy access to terminals for wiring purposes. The disc portion carrying the one-piece combined pins and terminals is secured to the cover by one captive screw of substantial diameter, centrally situated in the plug. By merely tightening this central fixing screw the outer covering of flex is automatically and effectively gripped between disc and cover.

The cover provides alternative entries for varying sizes of twisted, circular braided or c.t.s. type flex. Small sizes are gripped at small entries, and easily removable "knockouts" provide two larger entries for flex up to 16/012 gauge.

The new "Tucker" plug

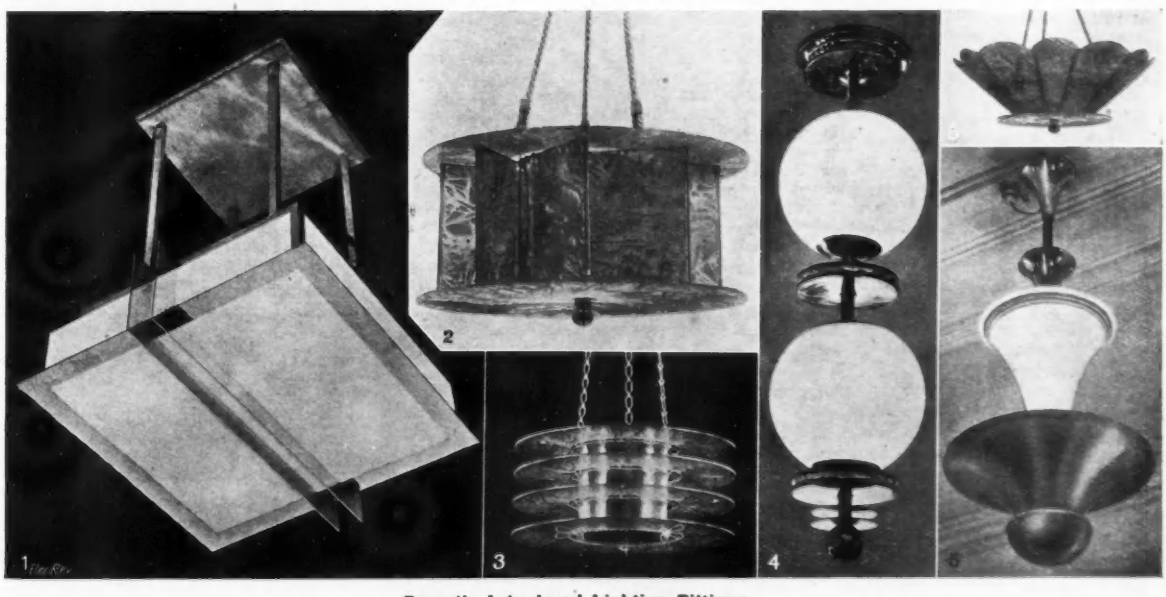
An Electric Connection Device

In spite of the lower current per candle-power consumed by present-day gas-filled lamps, the heat developed by them is manifestly more in the lamp-holder than was the case with the older vacuum-type lamps. In order to meet modern requirements for the use of higher wattage apparatus and to allow for the greater heat due to the lamps now used without introducing disadvantageous characteristics, a spring plunger suitable for the purpose in b.c. lamp-holders has been designed recently by MR. A. J. WILLMOT, 78, Priory Road, N.8, under the title of "Electric Connection Device" (Patent No. 386520). The spring plunger is formed in one piece by an appropriately heavy-gauge, high-conductivity, heat-resisting, non-corrosive helical spring running direct from the connection plate—to which the supply leads are clamped—to the terminal plate of the lamp or other apparatus which has been pushed into the lamp-holder with a slight twist to engage the bayonet catch. The top of the spring is formed into a flat spiral to give the required robust contact to the terminal plate of the apparatus. Its inner end is bent downwards to work piston-like to and fro in the tubular pin, over and around which the spring as a whole closely works, and obtains the mechanical support required when the lamp or other apparatus is pressed home and turned into the bayonet catch of the lamp-holder.



The electric connection device

In the accompanying illustration, *a* is the helical spring conductor working for mechanical support over and around the tubular pin *b*, into which, for additional support, plunges



Recently Introduced Lighting Fittings

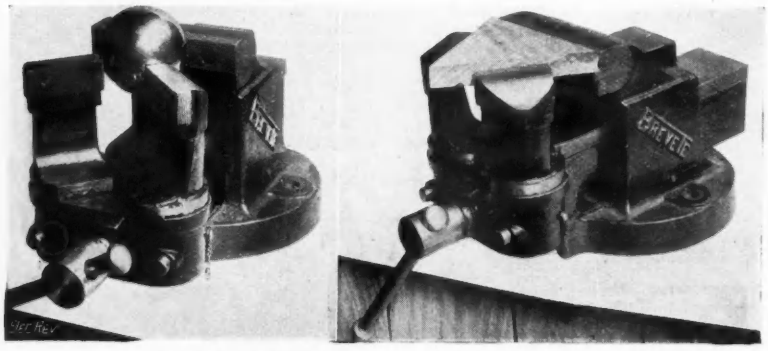
Messrs. Troughton & Young, Ltd., 143, Knightsbridge, S.W.:—(1) type F.587, £11 10s.; (4) type F.594/2, £7 17s. 6d.; (5) type F.579, £9 10s. *Messrs. L. G. Hawkins & Co., Ltd.*, 30/35, Drury Lane, W.C.2:—"Gossama" fittings, (2) type LGH21, £2 2s.; (3) type LGH, £1 13s.; (6) type LGH16, £1 15s.

D

the inner end *e* of the flat contact spiral *f*; *d* is the connection plate for the supply mains which carries both the spring connector *a* and the supporting pin *b*. The mechanical support is essential when the plunger is compressed in normal use, and the apparatus to be connected up is turned to engage in the bayonet catch. This is in order to prevent this twisting motion from inclining the connector itself.

Oxide Cathode Rectifying Tube Developments

The production of new designs of oxide cathode rectifying tubes has been fairly rapid of late, and the accompanying illustrations of selections from the products of PHILIPS INDUSTRIAL, LTD., Philips House, 145, Charing Cross Road, W.C.2, depict generally the sequence of development.



Two views of the new vice showing its adaptability

For charging small accumulators at up to 6 V and 1.3 A, type 451 is a popular unit. No. 367 has an output of 6 A at about 30 V. Higher output voltages demand greater spacing between electrodes and leads, and hence a bulb of greater length is used, with the anode terminals at one end and the filament leads at the other. Types 1029, 1039, and 1049 of this class have outputs of 6 to 40 A at 50 to 75 V.

No. 1039 represents the latest practice. Dispensing with the cap and the anode terminals, which are mounted directly on the bulb, has been rendered possible by the "chrome-iron seal," *i.e.*, flat plates of an alloy of chromium and iron, having the same coefficient of expansion as glass, and sealed directly into the ends of the bulb. These plates have the terminals and anode supports welded directly to them, giving great mechanical strength and excellent cooling of what was one of the hottest parts of the tube.

For applying from about 85 to 110 V r.m.s. to the anodes, a simple and effective method of avoiding direct flash-over between anodes is to surround the filament with a metal tube. This tends to make the arc discharge take the "positive column" form, with consequent distribution of the ions and avoidance of concentration in the neighbourhood of the anode. This tube is usually connected through a high resistance to some part of the external circuit to stabilise the ionisation voltage.

Tubes 1788, 1749, and 1759, have outputs of from 10 to 50 A, and on three-phase, with one tube connected in each phase and the outputs superimposed, the d.c. ripple is reduced to about 4 per cent. without the addition of any external smoothing, making it possible to construct rectifiers for up to 110 V, 150 A, for supplying cinema projectors. By placing the anodes in tubular arms attached to the bulbs the discharge assumes even more completely the "positive column," and types 1760 and 1768 of this design have outputs of 1.3 and 6 A at 230 V, and are suitable for multi-phase work.

For outputs of up to 1¼ kW, where three-phase four-wire supply is available, there is a special type of tube, No. 1063, with three anodes, by which it is possible to connect one anode to each phase without interposing a transformer (with the exception of a small transformer for a 15-W supply to the filament). The d.c. output is obtained between the filament (positive) and the neutral wire (negative). By thus dispensing with a large transformer the cost of the equipment is appreciably reduced and the efficiency on full load is about 92 per cent. and on quarter-load about 85 per cent. This unit is particularly suitable for small d.c. motors where speed and silence requirements render a.c. motors impracticable. For arc welding a rectifier combines the desirable characteristics of the d.c. arc with the regulation features of a transformer.

Tube 1069 has an output of 60 to 75 A, and by combining three of these in multi-phase formation an efficient welding rectifier with 180-A output is obtained.

An Adaptable Bench Vice

The "Noveto" universal vice, which is being introduced to the British market by MESSRS. E. L. YOUNGLESON, LTD., 67-69, Chancery Lane, W.C.2, can be used either as an ordinary parallel-jaw vice or as a three-point grip for articles of any shape or size within the specified range of the model. The fixed jaw has a cast-steel body and is of normal design. The movable jaw consists of two portions, approximately semi-circular, which move independently on swivels. It is made of high-tensile steel and all faces are case-hardened. The two parts are interchangeable, thus giving enough flexibility of gripping surface, jointly or separately, to secure the material rigidly and at any angle without damage. The models now available are: (1) 4½-in. jaws opening to 4⅞ in. parallel and taking rounds of from $\frac{3}{32}$ to 5¾ in., sold retail at £3 10s. with fixed base and £4 2s. 6d. with swivel base; and (2) 5½ in. jaws opening to 6$\frac{5}{16}$ in. and taking rounds from ⅛ to 7⅛ in., sold retail at £5 15s. with fixed base and £6 17s. 6d. with swivel base. Smaller sizes are to be introduced later.

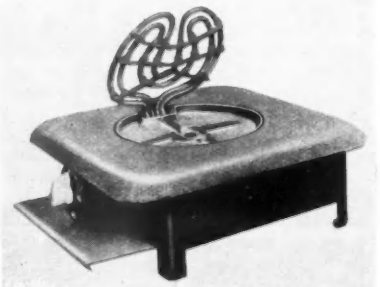
"Sashalite" Reflectors

The GENERAL ELECTRIC CO., LTD., is marketing through SASHALITE, LTD., 28, Victoria Street, S.W.1, a reflector unit for the "Sashalite" bulbs described last week. The 4½-V battery is inside the handle, and there is a pilot lamp to show whether the battery is in good condition before inserting the "Sashalite" bulb. The switch is operated by a trigger in the handle. The "Sashalite" bulbs are priced at 1s. 8d. each (not 2s. 6d. as stated last week).

A Radiant Type Boiling Plate

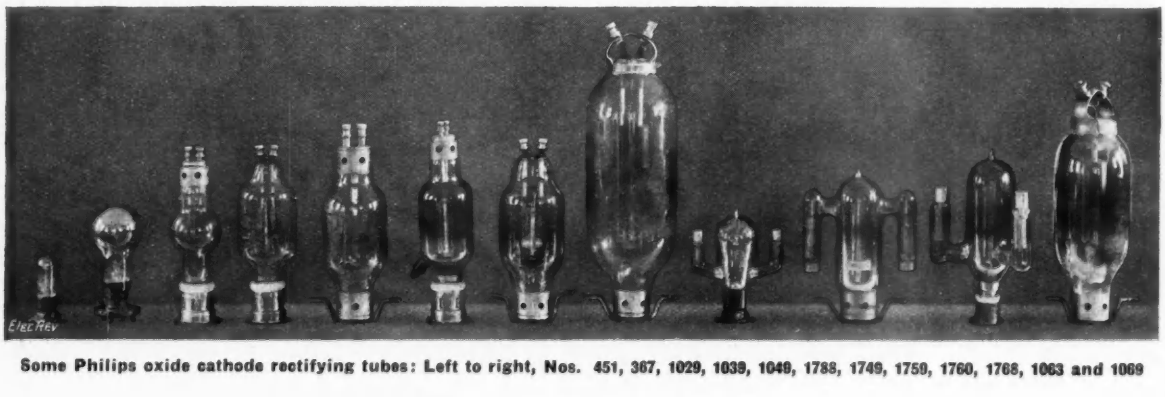
A recent introduction of the METROPOLITAN-VICKERS ELECTRICAL CO., LTD., Trafford Park, Manchester, is the "Metrovick" radiant type boiling plate with the element sheath in direct contact with the cooking vessel. It is claimed that three pints of water can be boiled in nine minutes with 2,000-W loading.

The element proper appears to be of the "open sheathed" type and is hinged at the back with a special shield protecting the leads. It is normally immediately above a polished reflector with drip channels: one claim is that because of the reflector special flat-bottom utensils are unnecessary.



The "Metrovick" boiling plate

Various sizes of plates are available to fit the leading makes of cookers. Round plates with loadings of from 1 to 2 kW and diameters of from 6¼ in. to 8 11/16 in. cost from £1 3s. 6d. to £1 15s., respectively. Rectangular plates with loadings of from 1,600 to 1,750 W cost £1 10s. each. Self-contained table-mounted equipment with these new boiling plates is available at £3 8s. (1,500 W, 8 in. dia.) and £3 15s. (2,000 W, 8 11/16 in. dia.). The table measures 14½ in. square and 5¼ in. high, and is finished in grey mottled vitreous enamel and fitted with a three-heat switch, plug-in fuse, and a removable drip tray.



Some Philips oxide cathode rectifying tubes: Left to right, Nos. 451, 367, 1029, 1039, 1049, 1788, 1749, 1759, 1760, 1768, 1063 and 1069

The National Register

The Executive Committee's report for the past year

THE annual meeting of the National Register of Electrical Installation Contractors is being held to-day (Friday) at the Institution of Electrical Engineers. The report which the Executive Committee is to present refers to the death of two of the original members of the Board—Messrs. W. A. Shaw and H. W. Roberts.

Both income and expenditure were higher during 1932—the former owing to fees received on account of a larger number of certificates issued and renewed and the latter because of increased expenditure on inspection. At the end of the year investments stood at £5,500, apart from £300 on deposit at the bank.

During the year 328 applications for registration were received; of these 124 were accepted, seventy-nine declined, and sixteen withdrawn, while the remainder (109) were still under investigation at the close of the year. The number actually on the Register at December 31st, 1932, was 1,563, representing a net increase of seventy-three. At April 7th last the total had risen to 1,612. Since the inception of the Register 367 registrations have been cancelled for various reasons, the principal being failure to renew registration (127), bankruptcy, liquidation, &c. (99), death, closing down business (88), failure to substitute a duly qualified manager (27), and bad workmanship (8). It is noted that about 39 per cent. of the applications received during 1932 were declined by the Committee.

During the year complaints against nine registered contractors were received. Thorough investigations were made and in four cases of alleged bad workmanship it was found that drastic action was not necessary. The other five instances related to alleged breaches of contract. The Committee found that in two cases there had been deliberate breaches, with no mitigating circumstances, and the names of the contractors concerned were removed from the Register. It was also decided to cancel the registration of a third contractor. One case was found to be the subject of a genuine mistake, while the remaining complaint was ill-founded and was withdrawn.

One of the local advisory committees notified the Executive Committee that a firm of registered contractors in financial difficulties had resorted to a private arrangement with its creditors to avoid being struck off the Register under Rule 10. Such a contingency was not contemplated when the rules were drawn up, and to meet this (and other matters) certain amendments are being put forward for the Board's consideration.

Experience in operating the Register has made it clear to the Committee that an extension of inspection is desirable. It has accordingly decided to appoint a full-time electrical inspector for the purpose.

At a conference last November between the Executive Committee and members of local advisory committees the importance of the latter giving the fullest possible information regarding applicants was stressed. The question of grading contractors was again raised, but it was finally agreed that the present time was not a suitable one in which to attempt this.

The Executive Committee records its appreciation of the work of the local advisory committees, the Scrutinising Committee, and the chairman (Mr. P. V. Hunter) and vice-chairman (Mr. A. H. Dykes).

After Nine Years

THE National Register is now in its tenth year and it seems opportune to examine its position and prospects before it completes its first decade. What does the electrical industry think of the Register? And how is it regarded by the public?

The Registration Board comprises representatives of eleven bodies within the industry, and it can be said right away that these representatives have done, and still do, a great deal of useful voluntary work. But we fear that there has been a gradual tendency for the bodies which appointed them to leave the Register entirely in their hands; in other words, having duly made the necessary gesture they have washed their hands of a rather troublesome matter. We must not forget that a few supply authorities have gone to the length of restricting their installation work to registered contractors, but if their number is increasing the present report omits to mention it.

Such being the attitude of the industry in general can the public be expected to display an intense interest in the matter? It is safe to say that not one member of the public in a thousand has ever heard of the Register. As the scheme was ostensibly for the public good this looks like failure. Unless electricity consumers and "prospects," who after all place the bulk of orders for installation work, are acquainted with the Register's aims and the cachet which its certificates are supposed to bestow the whole scheme becomes nugatory.

A Lack of Funds

If failure has to be admitted to whom shall the blame (if any) be attached? The Executive Committee has said that publicity is essential and the Secretary of the Register in a recent letter to us acknowledged that lack of money was a cause of weakness in this respect. We can see the difficulty. If the fees were placed at a figure sufficiently high to provide adequate advertising revenue that revenue would not be obtained, for candidates would be choked off. But if the nature of the Register is not brought home to the public even the present negligible fees are worthless expenditure.

Thus we arrive at an impasse. If the Register could be established by some means its certificates would become real assets and contractors would be glad to pay a high fee for them. But they are apparently not willing to provide the funds necessary to make registration of value. Will anyone else? If the E.C.A., the I.E.E., the B.E.A.M.A., the I.M.E.A., the E.W.F., the Central Electricity Board, and the other constituent bodies really considered the Register of real value to the industry as a whole they would perhaps see that funds for publicity purposes were placed at its disposal. Failing this only an appeal to the general public (who are supposed to be beneficiaries) seems to remain. We shudder to contemplate an addition to the already too-numerous flag days!

In his above-mentioned letter the Secretary of the Register, although confessing that money for advertising was hard to come by, considered that the other admitted weakness of the Register—lack of an adequate inspection system—was being attended to. The Executive Committee had seen its way to appoint a "responsible and efficient person" for the purpose. The present report says that he is to be a "full-time" official. This is not unreasonable if he is even to glance at examples of the work of the 1,612 registered contractors in all parts of England, Scotland, Ireland and Wales, at least once a year. We are inclined to think that his travelling expenses will be sufficient to maintain two or three other inspectors with more limited areas. Or what about the £5,500 which the Register has invested? The object of this seems to be to meet the gradual supersession of entrance-fee revenue by the much lower renewal fees—but this is a difficulty which would not threaten a well-established Register able to command a reasonably high tribute from its members. Gilt-edged securities won't provide much in the way of income and the money should be *used*—for wise use would prove a far sounder investment.

A Large Casualty List

We may digress here to consider the Register's efforts to secure a higher standard of installation work. Since the inception of the scheme 1,930 contractors have been registered, but the names of 367 of these have been removed from the Register for a variety of reasons. Even when allowance is made for deaths and the closing down of businesses, the proportion seems rather high, and yet the scrutiny to which applicants' qualifications are subjected appears to be thorough; in 1932 39 per cent. of the applications were declined.

It would certainly appear that the standard of installation work is not so high as it ought to be, for surely those contractors who secure registration are among the best, and if they find it difficult or impossible to remain on the Register what of the others?

In this report no mention is made of compulsion (in respect of either wiring rules or registration), but doubtless the matter will again be raised at to-day's meeting. Compulsion is often discussed as though it was the only conceivable basis for a satisfactory registration scheme, but in this respect the matter is hedged about with insurmountable difficulties, rendering it an impossible solution. Electrical contracting suffers from the drawback that it is not a profession. It is the kind of work that any handyman with very little electrical knowledge can embark upon—not always unsuccessfully. Of course, the same thing might be said of some professions, but, as a general rule, these involve the absorption of a great deal of highly specialised knowledge. This enables the members of those professions to band together to restrict the field. Sometimes legislative sanction is given to these restrictions, but we cannot imagine anything like this happening in the case of electrical contractors. In any event, if registration could be made compulsory would the present body administer the scheme? We think not.

So we come to the question: Without adequate funds and no hope of compulsory registration where does the Register stand?

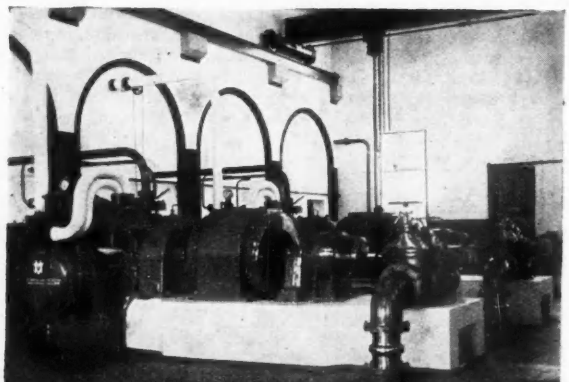
Electricity in the Smaller South African Towns

By OUR JOHANNESBURG CORRESPONDENT

POWER supply in South Africa, despite the relatively small white population, is rapidly becoming a key industry. In making this statement, I do not bear in mind the half-dozen big generating stations in the country, although they have an important bearing in respect of our electrification, but generally the numerous municipally owned "small-town" stations. These undertakings are becoming increasingly important, first, because the economics of power supply is being gradually put on a scientific basis, with resultant benefit to the consumer, and secondly, because of the market possibilities they offer to the manufacturer.

There are at the moment a number of these extensions and new undertakings on the tapis, but, unfortunately, the scarcity of money for capital purposes through the gold standard imbroglio in the Union precludes an immediate start with the bulk of these schemes. A few of these projects are in hand, but until capital importation is replaced on a normal footing they willy-nilly have to bide their time.

The town of Kroonstad is the first whose undertaking must in the meantime remain in a state of flux. The hope was to



The new Vryheid plant

change over completely to alternating current, 50 cycles with 6,600 V at the busbars and distribution pressures of 230/460 V with a new power station containing two 1,250-kW turbo-alternators and all the necessary gear appertaining thereto. To do this it would be necessary to raise a loan of £60,000, but, unfortunately, up to now, the state of the money market has remained unfavourable. If the programme can be carried out, and the tariff reduced accordingly, Kroonstad has a wide field for expansion, particularly the domestic load, which has hardly been touched owing to the high tariff under the present system.

Grahamstown is another important centre which will soon be in the market for extensions exceeding the amount involved in the Kroonstad undertaking. The City Council has resolved to proceed with the extensions to the electricity scheme which have now become urgent owing to the rising demand on the existing power station following quite extraordinary development of the domestic load. The scheme adopted involves the construction of a new power station on the western outskirts of the town, in which two new turbo-alternators will be installed, together with certain of the boiler units now operating in the old power station. The consulting engineer is proceeding with the specifications with all speed.

Lichtenburg is another town which has to await better monetary conditions before it can proceed with its power extensions. Meanwhile, the Town Council is juggling about with one specification after another, and trying to make a start with a scheme that will throttle adequate development at the outset. However, it is certain that eventually a £25,000 scheme will be decided on, as originally advised by the consultant. Klerksdorp has been more fortunate, and recently managed to raise a loan of £25,000, which will be used to provide a small but up-to-date a.c. system. Vryburg, as well, will soon endeavour to raise a like amount for a new undertaking, and Parys contemplates spending an amount of £19,000 on power extensions.

Plants Recently Completed

With regard to the "small-town" undertakings just completed, mention may be made of Vryheid, where a new alternating current plant has just been completed by the Metropolitan Vickers Co. The present plant is one of the most modern sets in South Africa, and as the power station has been built to allow of expansion on a large scale, it is anticipated that provision is available for the next ten years. With the new additions and the previous expenditure on power plant the total amount involved is in the region of £70,000.

At King Williamstown the new turbine plant has completed the guarantee period. Each turbine is rated at 1,250 kW nominally, but is capable of developing up to about 1,400 kW. These machines generate at 3,800 V, this somewhat unusual voltage resulting from the earlier conversion of the scheme from 2,200 V single phase. Queenstown has also just completed its new power station. The plant consists of two Bellis-General Electric turbo-alternators, each rated at 1,250 kW, together with two new Babcock and Wilcox boilers. The switchgear consists of an addition to the original B.T.-H. truck-type board. Although the plant has only been in commission a short while, a saving of more than thirty per cent. in the coal bill has been effected.

This review, which is necessarily brief, covers only in cursory fashion the number of power extensions now in hand, and is principally intended to show what the small and progressive towns are doing. Their cumulative effect on the trade is promising in every respect, and furthermore focuses attention on our power developments.

Cathode Ray Oscillography

ELECTRONS are now well known as the "active constituents" of radio valves, but their use as electric pencils for delineating the form of electric forces is less well known. The pioneer use at the Radio Research Station at Slough of the Department of Scientific and Industrial Research of the cathode ray oscillograph for this purpose has resulted in numerous requests for information regarding the technique underlying the method. The Department is therefore about to issue an important volume under the title of "The Application of the Cathode Ray Oscillograph in Radio Research," by Mr. R. A. Watson Watt, Mr. J. F. Herd, and Mr. L. H. Bainbridge Bell (H.M. Stationery Office, 10s. net). Circuit arrangements are described in detail in which this instrument is used to make an atmospheric, lasting only 1/500th of a second, draw and photograph its own portrait—itself opening and shutting the shutter of the camera and moving the film along in readiness for the next exposure—and indicate the route by which the atmospheric has arrived.

An oscillograph speed of twelve miles per second enables another of the applications described to draw separate pictures of a wireless signal received along the ground from the transmitting station and of echoes of that signal which are reflected from the upper atmosphere. This it does, although the time between the signal and its first echo is only 1/1,500th of a second, and the time between two echoes may be less than 1/3,000th of a second. The cathode ray oscillograph is adding materially to our knowledge of "fading" and helping to analyse the electrical forces, in magnitude, direction and time relationship, in wireless signals. The data which it gives assist in the design of more efficient aerial systems.

Apart from such applications the book describes a number of ways in which the cathode ray oscillograph is likely to be useful in navigation by sea and air, in wireless receivers, and in relay devices. Its response is so rapid that, with signals in which rapid "jabs" of energy lasting only 1/2,000th of a second are sent out, a bearing can be read correctly without confusion by the echoes. The correct reading is obtained in a form of a bright definite line on a fluorescent screen which acts as the dial of this wireless compass, while the echoes produce only a faint pattern around it. These signal "jabs" can be produced simply and cheaply by a modification to an ordinary wireless transmitter and a compact and inexpensive receiver is described in the book which could be placed on the bridge of a ship and used as a collision preventer in fog.

By making the light from the fluorescent screen act on photoelectric cells or by collecting the electrons in tiny metallic boxes, the cathode ray oscillograph can be used to show when a ship deviates from a set course and further used to correct such deviation automatically. Other applications described include a receiver which can record morse signals through the heaviest atmospherics, and a receiver that can record separately morse signals from two stations on the same wavelength, provided the signals are not arriving from exactly the same direction.

Business and Industrial Notes

The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments, Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations, and Failures

American Reorganisation

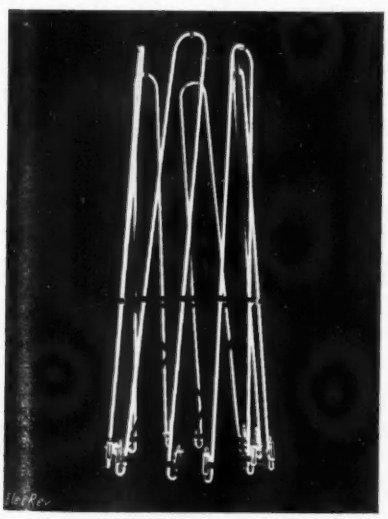
In our leading article this week reference is made to meetings of the Sales Section of the National Electric Light Association which were held in Chicago on March 21st and 22nd to wind up affairs in preparation for the transfer of certain of its activities to the new Edison Electric Institute. A number of recommendations were drawn up regarding such operations, and these suggestions will be brought forward for guidance at a Convention which is to be held in Chicago from June 5th to 8th. It is expected that the activities referred to will be continued by some agency to be formed by the Institute to carry on the work of the Sales Section. The National Cookery Council and the Electric Refrigeration Bureau will be continued in co-operation with the Institute. Reports prepared by the Home Appliance Committee on home heating devices and domestic laundry equipment are ready for publication, and they are not to be wasted. It is advised that work shall be continued on industry co-operation, the financing of merchandise sales to dealers, and laboratory approval of appliance sales. The Home Lighting Committee recommends further sales promotion on the indirect portable lamp; a report stands prepared on home air conditioning; and the Outdoor Lighting Committee advocates a boost of outdoor sports as a source of new business. Manufacturing interests are expected to play an essential part in Institute operations. From what we read Americans themselves seem to be very much in the dark regarding the programme of the new Institute.

A Forty-hour Week Proposal

The Engineering Employers' National Federation has informed the unions of the men in the industry that it is investigating the facts of the trade depression, as well as possible remedies, and that when the investigation is sufficiently advanced it will ask the unions to join in the consideration of constructive steps to effect improvement. *The Times* says that this announcement is made now because the unions have begun an agitation for a forty-hour week without reduction of wages in the engineering, shipbuilding, and ship-repairing industries, and the employers point out that the circumstances require consideration not of one proposal alone but of all relevant information and appropriate suggestions.

Neon Aerodrome Lighting

The increase in flying is rendering the use of efficient and distinctive beacons at aerodromes essential, and a new one consisting of red neon tubes and made by the General Electric Co., Ltd., is therefore of considerable interest. As our illustration shows, it consists of six hair-pin shaped neon tubes arranged round a tower in the form of a truncated cone, approximately 14 ft. high. The tubes are fed from transformers placed close to the tower, and the switchgear may be situated in any suitable position. It can also be arranged for the beacon to be started by a push button in the aerodrome control room. Three special single-phase step-up transformers are employed, each feeding two neon tubes, and they are so designed as to eliminate the necessity for having series choke coils. Under favourable conditions the beacon is visible from a distance of fifty miles, and it can be made to flash any morse character, thus indicating the name of the aerodrome.



The new G.E.C. aerodrome beacon

The Marking of Imported Clocks

The Board of Trade has referred to its Standing Committee an application for an Order-in-Council to require the marking with an indication of origin of imported clocks and clock movements (including electrically driven types), and synchronous electric motors of the type used for clocks or time recording instruments. Representatives of any interests substantially affected by the application who desire to be heard in opposition at the public inquiry which will be held by the Committee should communicate with the secretary, Mr. E. W. Reardon, at the Board of Trade Offices, Great George Street, S.W.1, not later than May 20th.

The Budget

The Chancellor of the Exchequer presented his Budget for the current financial year on Tuesday last. The alterations in taxation do not directly affect the electrical industry as a whole. The beer duty is reduced, but income tax remains at the same level; some relief is gained by a reversion to the method of collecting the tax in two equal instalments. A duty of 1d. per gallon is imposed on lighting, lubricating, and fuel oils, and as from January 1st next a new scale of duties on heavy motor vehicles is to come into force. Under this the duties on electrically propelled vehicles will be very substantially increased; for instance, vehicles of less than 12 cwt. unladen weight will pay £10 instead of £6, vehicles weighing over 10 tons will be liable to a duty of £85 (instead of £24) if equipped with pneumatic tyres, or £113 6s. 8d. (against £30) if they have solid tyres.

The Moscow Affair

The three Metropolitan-Vickers Electrical Co.'s engineers who were banished from Russia—Messrs. Monkhouse, Cushny, and Nordwall—together with Mr. Gregory, who was acquitted at the recent Moscow trial, arrived in London on Sunday. A statement issued by the Metrovick Co. says that the whole matter of the trial has been discussed, but the engineers are entirely unable to account for or explain the arrests. The company is more than ever convinced of the innocence of Messrs. Thornton and Macdonald.

M. Ozersky, head of the Soviet Trade Delegation in London, and his assistants, MM. Kharitonoff and Bessonoff, have been recalled to Moscow "for consultation."

Duties on Vitreous-enamelled Goods

The Import Duties Advisory Committee has now before it applications for increasing the present rate of duty on wrought enamelled hollow-ware of iron and steel for domestic purposes, and for extending it to other classes of vitreous-enamelled products of iron and steel, including electric lighting fittings, refrigerator cabinets and parts, and sheets and plates for advertisement signs. Any representations which interested parties may desire to make should be addressed to the Secretary, Import Duties Advisory Committee, Caxton House (West Block), Tothill Street, S.W.1, not later than May 8th.

Composite Steel Manufacture

A booklet entitled "Eclipse Composite and Solid Die Steels" received from James Neill & Company (Sheffield), Ltd., concisely describes composite steel, *i.e.*, steel combined with iron in the ingot and afterwards forged or rolled to the required section. The material is extensively used for the production of press tools, &c. The booklet also contains detailed heat-treatments instructions for both the company's composite and special steels, including many practical hints of value to engineers and tool makers.

A Large Set for Battersea

The Metropolitan-Vickers Electrical Co., Ltd., has received an order from the London Power Co. for a 105,000-kW turbo-generating plant for the Battersea power station. This is claimed to be the largest machine ever ordered in this country, and the value of the order is approximately £250,000.

Municipal Trading at Ealing

A sub-committee of the Ealing Electricity Committee recently received a deputation from the Ealing Chamber of Commerce with regard to the question of the direct sale of electrical fittings and apparatus from the Corporation's new electricity showrooms. The representatives of the Chamber of Commerce were informed that the sub-committee was prepared to suggest to the Electricity Committee that the Council should be recommended to approve an arrangement whereby the Corporation would grant to local electrical contractors a trade commission of one-third of the difference between the cost price to the Corporation of articles and the recognised retail prices on all direct cash sales at the showrooms resulting from the introduction of customers by the contractors. The deputation stated that it had no authority to accept or refuse this tentative offer, but would consult the committee of the Chamber of Commerce and arrange for a reply to be forwarded. Subsequently a letter from the Chamber of Commerce was received by the Electricity Committee intimating that after discussing the question it did not consider the offer to be an equitable arrangement. The Chamber wished to confirm that it was distinctly opposed to retail sales from the showrooms, and therefore asked that in the interests of local traders the Council should cease to sell articles which were usually supplied by traders. It further suggested that pro-

spective customers should be told where the required articles could be obtained in the district. The Electricity Committee, however, recommends the Council to continue to exercise its trading powers and to inform the Chamber of Commerce that it is still prepared to grant to local electrical contractors the commission on direct cash sales as specified.

All-electric House at West Hartlepool

About 16,000 people visited the all-electric demonstration house which was open for three weeks recently at West Hartlepool under the auspices of the local Electrical Development Association Circle. Instead of the modern types of dwelling usually chosen for such demonstrations, the Circle selected a commodious old-fashioned house. The lounge, dining room, kitchen, bathroom, three bedrooms and nursery were electrically equipped in model style and the remaining rooms were used for demonstrating vacuum cleaners and other electrical appliances and for the display of electrical fittings. As an immediate result of this effort a number of cookers have been hired and numerous inquiries received for other apparatus.

Recent Contracts

The British Broadcasting Corporation has placed a contract with the Radio Communication Co., Ltd., for the supply and erection of two 700-ft. lattice steel masts at the Midland Regional station, near Droitwich, similar in design to the 500-ft. masts recently built by the same company for the North Regional, Scottish Regional, and West Regional stations.

Messrs. Girlings, Ltd., have received an order for a thousand ¾-kW fires with an assurance that several thousand more will shortly be required by the same firm.

Fire protection equipment supplied by the Automatic Light Control, Ltd., is to be fitted on the new Burns Philp motor liner *Malaita*, now being built at the Barclay Curle & Co.'s Clydeholm shipyard in Glasgow. The ship is believed to be the first to be built in accordance with the new Safety of Life at Sea requirements relating to fire protection, &c.

Messrs. C. A. Parsons and Co., Ltd., have recently received an order for a 900,000-kVA turbo-alternator for testing switchgear in the laboratories of the N.V. tot Keuring van Electrotechnische Materialen, at Arnhem, Holland. The machine will give its output at either 11,000, 6,350, 5,500, or 3,200 V. Another turbo-alternator for testing switchgear is also being constructed at the Heaton works for Messrs. A. Reyrolle and Co., who already possess a 1,500,000-kVA, 22,000-V unit supplied by Messrs. Parsons a few years ago.

Electric Brakes for Cranes

In connection with the article on "Electric Brakes for Cranes" in our April 14th issue (page 518) Messrs. Joseph Adamson & Co. have sent us a pamphlet describing their "Slohoist" control gear.

New Municipal Showrooms

Owing to the cost of provision and maintenance, Barnes Town Council has decided against a proposal to open electricity showrooms.

Plans have now been prepared by Messrs. Coales & Green, architects, Market Harborough, for new offices, showroom, stores, &c., for Kettering Electricity Department in Adam and Eve Street, and the Electricity Committee has decided to invite tenders for the erection of the buildings.

The Wallasey Corporation has approved plans for electricity offices and showrooms in Conway Street

New Wiring Regulations for Victoria

New wiring regulations based primarily on the wiring rules of the Standards Association of Australia are being prepared by the Victorian Electricity Commission.

Temporary Church Lighting

Henley "Pyrobest" flexible cords were used for the special lighting in the Cathedral Church of St. Peter, Exeter, during the recent presentation of John Masefield's passion play "Good Friday." The installation was carried out by Messrs. Charles Lye, of Exeter.

Illumination of Streetly Chapel

Particular care has been taken in the new lighting installation at Streetly Chapel to provide adequate and well diffused illumination, yet at the same time keeping the lights themselves out of sight so as not to detract from the beauty of the old Norman architecture. The altar lighting consists of two "Benjamin" parabolic angle reflectors with 60-W lamps, these being fixed above the pillars near the altar at a height of about 10 ft. 6 in. and out of view from the body of the church. In the chancel a reflector is fitted above the central arch, while for the illumination of the nave the fittings have been placed with their bottom edges level with the roof trusses. The installation was carried out by M. T. A. Mallender, Worksop.

Changes of Name

The Consolidated Radio Co., Ltd., 75, Kilburn Lane, W.10, has changed its name to Cam Electrical, Ltd.

Dumote, Ltd., 8, Staple Inn, W.C.1, will in future be known as Exo, Ltd.

The Canadian Customs Tariff

Modifications have been made in existing items in Schedule E of the trade agreement between the United Kingdom and Canada. Under the agreement the new import duties on telephone apparatus and complete parts are: British preferential tariff, 10 per cent.; intermediate tariff, 25 per cent.; general tariff, 30 per cent. *ad valorem*. For electric light and arc carbons and contact carbons the new duties are 22½ per cent., 32½ per cent., plus 20 cents per lb., and 35 per cent., plus 20 cents per lb., respectively.

A Photo-electric Control Display

A novel window display has been arranged by the British Thomson-Houston Co., Ltd., at Crown House, Aldwych, W.C.1. The central feature is a lattice gate which is operated by a B.T.-H. photo-electric relay. Passers-by can operate the

A B.T.-H. photo-electric control display

relay by placing their hands against a certain portion of the window. As the gate opens a flood of light is directed on the display, and after a few seconds the gate automatically closes and by means of this movement the floodlights are extinguished.

Trade Announcements

The electrical and radio business at 48, St. John's Road, Tunbridge Wells, known as Lambert's, has been taken over by Mr. L. E. Pearce, and will be carried on under the style of the St. John's Electrical Co., electrical contractors and radio specialists.

The Hotpoint Electric Appliance Co., Ltd., has recently opened a new branch at Cambridge House, 26, Tombland, Norwich, and Mr. F. Stannard, the East Anglian representative of the company, has been appointed manager.

The telephone number of the London warehouse of the British Aluminium Co., Ltd., 25-29, Pancras Road, N.W.1, has been changed to Terminus 5301-2.

David Allen Neon Displays, Ltd., have amalgamated with Claude-General Neon Lights, Ltd., an associated company of the G.E.C. In future, the whole of the manufacture and erection work required for both undertakings will be carried out by Claude-General Neon Lights, Ltd., to the board of which Mr. S. C. F. Allen has been appointed.

Batteries, Ltd., have recently concluded arrangements with the patentees of the "Keepalite" emergency lighting system, whereby the company can supply the "Keepalite" panel under licence to be used in conjunction with "Nife" nickel cadmium alkaline accumulators.

The Ever Ready Co. (Great Britain), Ltd., is opening a further distributing depôt at 23, Gallowgate, Newcastle-on-Tyne, and stocks of "Ever Ready" electric lamps and batteries will be available as from May 1st next. The telegraphic address is "Eveready, Newcastle-on-Tyne" and the telephone number Newcastle 26553. The company now has distributing depôts in Bristol, Edinburgh, Glasgow and Leeds.

The Lombard Code Service

Code Services, Ltd., Brettenham House, W.C.2, announce the inauguration of a new telegraphic code service—called the "Lombard"—by which it is claimed that cabling costs can be reduced by between 15 and 40 per cent.

Municipal Trading at Brighton

Subsequent to a notice of motion urging that the Brighton Corporation electricity showrooms should be used as offices and showrooms only for the purpose of advertising and generally developing the undertaking, and that no appliances be sold there retail in competition with traders in the town, the borough electrical engineer has prepared a lengthy report, in which he says the activity of the Electricity Department must not be curbed in its initiative by restrictions which, in themselves, give rise to apathy and would not be countenanced by any commercial organisation, nor by its competitors, the gas company. "In considering the notice of motion," he says, "it is only fair that the possibilities of the showroom in conjunction with the stimulus which the Electricity Department is giving to the electrical contractors of Brighton should be borne in mind. The 1926 Electricity Act gives power for the sale of electrical apparatus to all electrical undertakers by

placing these enterprises on the same footing as their keen competitors, the gas undertakings. Is it conceivable that if the Brighton undertaking had been owned by a statutory company they would have failed to take advantage of these powers?" The engineer then gives a list of thirty-five municipal undertakings in all parts of the country, showing that thirty-two of these permit sales at showrooms, one sells apparatus through contractors, retaining a small commission, one does not sell at all, and the third undertakes hire-purchase only. The Electricity Committee has approved the report.

The new Shanklin premises of the Isle of Wight Electric Light & Power Co., Ltd., occupying a prominent position at the corner of Regent Street and Clarendon Road

Employment During March

Although still bad, a general improvement in employment in the engineering industry is reported in the *Ministry of Labour Gazette*. The total out of work fell from 269,697 in February to 257,847 last month, the percentage being 26.4 as compared with 27.6. In electrical engineering employment continued very slack, those unemployed numbering 17,795 as against 18,132; the percentage fell from 19.3 to 18.9. There was an increase in the number out of work in the electric cable, wire, and lamp manufacturing group from 21,382 to 22,244 (from 18.2 to 18.9 per cent.), but in the electrical wiring and contracting industry there was an improvement from 4,841 to 4,730 (from 19.3 to 18.9 per cent.).

Manchester Building Trades Exhibition

There are practically no new features of electrical interest at the thirteenth Manchester Building Trades Exhibition which was opened at the City Hall, Deansgate, on Tuesday by the Lord Mayor, Ald. W. Walker. Paint-sprayers are being exhibited by both B.E.N. Patents, Ltd., and the Kurt Erlach, Ltd., and these are driven by electric motors ranging from ¼ to 1 h.p. of standard voltages. Various types of cables for use in light and power installation are exhibited by the Cable Makers' Association, and conductors of all types by the London Electric Wire Co. & Smiths, Ltd. The exhibition will remain open until May 6th.

Duties on Electric Shot-firing Apparatus

The Import Duties Advisory Committee announces that it has decided not to make any recommendation in respect of the application previously advertised for the imposition of an increased import duty on electric exploders for shot-firing in mines and quarries.

For Sale

Poplar Borough Council has turbo-alternators for sale.
(See our classified advertisements.)

Social Events

For a first effort the Lewcos Staff Dramatic Society's production of Ian Hay's "Sport of Kings" at the Guildhall School of Music, London, on Tuesday, was very good. Mr. Eric Lockett entered into the spirit of his rôle as Algernon Sprigge, and had an admirable foil in the blasé Sir Reginald Toothill (Mr. Douglas Smith). Miss Margaret Baker had an all-too-small part as Katie Purdie, the wife of Amos Purdie, J.P. (Mr. Sydney Graefe). As Dulcie Primrose, Miss Sybil Hughes gave a very creditable if restrained performance. Other members of the cast were the Misses Dorothy Parker, Vera Durien, Kitty Fisher, Gladys Stoneham, and Messrs. Sidney Holt, Charles Hill, George Sinclair, and Henry Tyndall. The play was produced by Mr. Frank Lockett.

The Birmingham Electric Club held its Spring golf meeting at Copt Heath on April 24th. At the supper which followed Mr. W. A. Baxter, president of the Birmingham Electrical Golfing Society, which is being dissolved, handed to the Birmingham Electric Club its three competition cups—the Railing Cup, the Bayliss Cup and the Trades Cup—for competition among the Club members. Mr. F. Boyes, Mr. G. Donovan, Mr. Millinger and Mr. Masters, members of the committee of the Golfing Society, supported their president. Mr. J. M. Dunkley, president of the Birmingham Electric Club, accepted the gift and thanked the donors. One of the cups was afterwards presented to Mr. S. J. Sadler (lowest net score) and the other cups are to be presented at golf meetings later in the season.

Commercial Visits to Brazil

The latest Department of Overseas Trade publication of the "Hints to Commercial Visitors" series relates to Brazil. All the usual features are included, such as transport facilities and costs, conditions relating to samples, immigration regulations, &c.

The Electrical Industries Benevolent Association

The annual general meeting of the Electrical Industries Benevolent Association (until recently the Electrical Trades Benevolent Institution) is to be held to-day at the Institution of Electrical Engineers, W.C.2, to receive the report of the Council and to pass the accounts for the year 1932. Mr. R. P. Sloan, the president, will take the chair. Mr. R. Robson and Mr. W. E. Hobbs have resigned from the Council, and Mr. R. P. Sloan, Sir Andrew Duncan, Sir Felix Pole, and Mr. Geo. Balfour have been nominated as members. It is stated in the report that the income for the year from contributions amounted to £3,367, to which was added interest from investments, making a total of £5,512. Grants made totalled 334, absorbing £2,356, while in addition eight pensions were paid at a cost of approximately £294, making the total expenditure on relief £2,650. During the year the rules were completely remodelled and the title of the Association was changed to make it more applicable to its activities. It is gratifying to record an increase in membership.

Bruce Peebles Calendar

A picture of Edinburgh Castle in three colours makes an excellent subject for Messrs. Bruce Peebles & Co.'s calendar for the year May, 1933—April, 1934. Monthly tear-off sheets are provided, each bearing illustrations of the company's products.

Prices of Materials

The following prices are only general, and they may vary according to quantities and other circumstances :—

CHEMICALS, ETC.	Price April 26th.	Fortnight's Inc. or Dec.
a Acid, Oxalic ... ... per cwt.	50s.	—
a Ammoniac, Sal ... ... per ton	£40	—
a Ammonia, Muriate (large crystal) ... ,,	£38	—
a Borax ... ... ,,	£17	—
a Copper, Sulphate ... ... ,,	£19 15s.	—
a Potash, Chlorate ... ... per lb.	3½d. to 4¼d.	—
a ,, Perchlorate ... ... ,,	6d.	—
a Shellac T.N. ... ... per cwt.	£3	—
a Sulphur Commercial ... ... per ton	£11	—
a ,, Roll ... ... ,,	£11	—
a Soda Chlorate ... ... per lb.	3¼d. to 3¾d.	—
a ,, Crystals... ... ... per ton	£5 to £5 5s.	—
a Sodium Bichromate, casks ... ... per lb.	4d.	—
METALS, ETC.		
b Aluminium, Ingots ... ... per ton	£100 to £105	—
b ,, Wire ... ... per lb.	1/1 to 1/9	—
b ,, Sheet and Foil ... ,,	1/2 to 2/9	—
p Babbits Metal and Anti-friction Metals—		
Grade I ... ... per ton net	£152	£11 inc.
Grade II ... ... ,,	£107	£7 inc.
Grade III ... ... ,,	£57	£3 inc.
c Brass (rolled metal 2" to 12" basis)... per lb.	7d.	—
c ,, Tubes (solid drawn) ... ... ,,	8¾d. to 9d.	—
c ,, Wire, basis ... ... ,,	7¾d.	—
c Copper Tubes (solid drawn) ... ,,	9¼d.	—
g ,, Bars (best selected) ... per ton		
g ,, Sheet ... ... ,,	£61	—
g ,, Rod ... ... ,,		
d ,, (Electrolytic) Bars ... ... ,,	£34 5s.	—
d ,, ,, Sheets ... ... ,,	£64	—
d ,, ,, Wire Rods ... ,,	£44 10s.	10s. inc.
d ,, ,, H.C. Wire ... per lb.	7 1/16d.	1/16d. inc.
f Ebonite Rod ... ... ,,	1/3 to 1/6	—
f ,, Sheet ... ... ,,	1/3 to 1/6	—
m German Silver Wire ... ... ,,	2/2	—
h Gutta-percha, fine ... ... ,,	nom.	—
h India-rubber, Para fine ... ... ,,	4¼d.	¼d. inc.
i Iron, Pig (Cleveland No. 3)... ... per ton	62/6	—
i ,, Wire, galv. No. 1, P.O. qual. ,,	£20	—
g Lead, English pig ... ... ,,	£12 10s.	5s. inc.
g Mercury ... ... per bot.	£9 15s. to £10	7s. 6d. to 15s. inc.
e Mica (in original cases) small ... per lb.	6d. to 3/6	—
e ,, ,, medium ... ,,	4/- to 8/-	—
e ,, ,, large ... ,,	8/6 to 17/6 & up	—
p Phosphor Bronze, plain castings ... ,,	1/1	—
p ,, ,, drawn bars & rods ,,	10¼d.	—
p ,, ,, rolled strip & sheet ,,	10½d.	—
p ,, ,, wire ... ... ,,	11⅛d.	—
o Platinum ... ... per oz.	£7 10s.	—
d Silicium Bronze Wire ... ... per lb.	8 3/16d.	1/16d. inc.
r Steel, magnet, in bars ... ... ,,	7¼d.	—
g Tin, Block (English)... ... ... per ton	£163 15s. to £165 15s.	£7 inc.
n ,, Wire, Nos. 1 to 16 ... ... per lb.	2/11	—

Quotations supplied by :—

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta Percha and Telegraph Works Co., Ltd.
g James & Shakespeare.
h Edward Till & Co.
i Bolling & Lowe.
l Richard Johnson & Nephew, Ltd.
m P. Ormiston & Sons.
o Johnson, Matthey & Co.
p C. Clifford & Sons, Ltd.
r W. F. Dennis & Co.

New Catalogues and Lists

Callender's Cable & Construction Co., Ltd., Hamilton House, Victoria Embankment, E.C.4.—A pamphlet (No. 50) describing the new Callender service system for radio relay work.

Marryat & Place, 40, Hatton Garden, E.C.1.—A leaflet dealing with window signs and lighting units.

Non-Ferrous Die Casting Co., Ltd., Nonferdica Works, North Circular Road, Cricklewood, N.W.2.—In reply to every inquiry regarding die castings the company now sends a catalogue in the form of a camerascope (returnable) with photographs of its products.

Automatic Electric Co., Ltd., Melbourne House, Aldwych, W.C.2.—A large poster relating to "Strowger" automatic telephones.

British Insulated Cables, Ltd., Prescot, Lancs.—A pocket road map of the British Isles with lists of B.I. products and branch offices.

Rhodes, Brydon & Youatt, Ltd., Waterloo Engineering Works, Gorsey Mount Street, Stockport.—Publication No. 154, relating to the "Super-type Fullway Mopump."

Henderson Electrical & Wireless Service, Queen's Road, Brighton.—A leaflet showing examples of "Keyway" switch and fuse gear.

Newtons of Taunton, Ltd., 319, Regent Street, W.1.—An illustrated brochure dealing with static rectifiers for cinema projectors, &c.

A. Reyrolle & Co., Ltd., Hebburn-on-Tyne.—Pamphlet No. 776 containing particulars of Messrs. J. H. Holmes & Co.'s "Castle" heavy-current generators for electroplating and electrolytic work.

Britannia Batteries, Ltd., 233, Shaftesbury Avenue, W.C.2.—A catalogue of Britannia stationary lead accumulators.

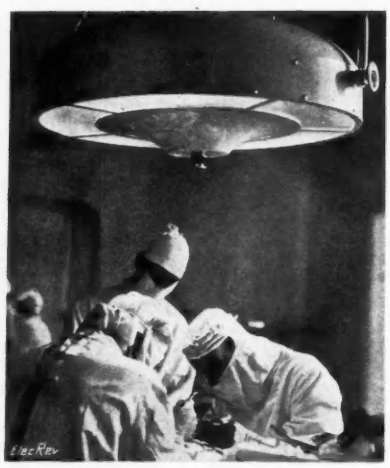
T. C. Jones & Co., Ltd., 93-95, Wood Lane, Shepherd's Bush, W.12.—An illustrated catalogue entitled "Power Transmission." It has 132 pages and is strongly bound.

Wego Condenser Co., Ltd., Bideford Avenue, Perivale, Middlesex.—A catalogue of Wego condensers, announcing alterations to various types.

Heyes & Co., Ltd., Water-Heyes Electrical Works, Wigan.—The April issue of the "Wigan Review," containing a description of "Wigan" No. 4 low-tension battery exploders.

General Electric Co., Ltd., Magnet House, Kingsway, W.C.2.—Booklet No. O.S. 6509, describing a new neon aerodrome beacon.

Premier Electric Heaters, Ltd., Keeley Street, Birmingham. — Leaflet No. 230, which deals with "Premier Multi-boilers."



The striking illustration appearing on the cover of a new G.E.C. brochure (F.6476) dealing with hospital operating theatre lighting fittings

Switchgear & Equipment, Ltd., Banbury.—A folder on improved h.p. liquid fuses.

Parmiter, Hope & Sugden, Vernon Street, Longsight.—A leaflet giving particulars of a new "Aeroflex Fluvent" type "AFB" fuse unit.

Cellactite & British Uralite, Ltd., 296-302, High Holborn, W.C.1.—A catalogue of "Cellactite" roofs and vertical cover. There are a number of illustrations in colour.

Dubilier Condenser Co. (1925), Ltd., Ducon Works, Victoria Road, North Acton, N.W.3.—A leaflet giving particulars of static condensers for the power factor correction of neon signs.

Radio Instruments, Ltd., Purley Way, Croydon.—Priced and illustrated pamphlet of circuit diagrams, tables, and technical data for the application of Class B amplification battery radio receivers, forming a guide to the correct valves, "Drivermu" transformers, and "R.I." output chokes.

Electric Resistance Furnace Co., Ltd., 17, Victoria Street, S.W.1.—An illustrated brochure relating to "Efco" resistance furnaces.

Drayton Regulator & Instrument Co., Ltd., West Drayton, Middlesex.—Publication No. B.P.57, dealing with small diameter pressure gauge.

E. L. Youngleson, Ltd., 67-69, Chancery Lane, W.C.2.—A leaflet (in French) illustrating and describing the new "Noveto" "universal" vice.

Bankruptcy Proceedings

D. S. B. Shannon, electrical engineer, Lichfield Road, Mere Green, Warwickshire.—The public examination was held recently at the Court House, Birmingham. It was disclosed that the ranking liabilities totalled £1,264, and there was a deficiency of £1,231. Since 1929 the debtor had conducted several businesses which had proved unsuccessful, and as the result of creditors' suing he had filed his petition. In January, 1931, he became entitled to moneys amounting to approximately £5,400, part of which he used to discharge old debts and the remainder was put in trust. Debtor had given charges on that investment to secure borrowed moneys. The examination was provisionally closed.

W. S. Handley and **G. Taylor** (trading as Handley and Morgan), wireless dealers, 55, Lower Union Street, Bristol.—The public examination of these debtors was held on April 21st at the Guildhall, Bristol. According to the statement of affairs prepared there were ranking liabilities of £969 and a deficiency of £965. The business chiefly consisted of the supply and maintenance of amplifiers for totalisators on greyhound racing tracks. The failure was attributed to want of capital, heavy overhead charges, and pressure by creditors. The examination was closed.

H. H. Edwards, formerly electrical engineer, 26, Churchfields, Wellington, Somersetshire.—The first meeting of creditors was held at the Parade Assembly Rooms, Taunton, on April 21st, when a statement of affairs was submitted which showed ranking liabilities of £180, with assets estimated to realise £80, leaving a deficiency of £100. Debtor attributed his failure to contracts for which he had obtained stock not materialising, and slackness of trade. The case being a summary one was left in the hands of the Official Receiver as trustee.

C. E. Wooton, electrical engineer, 10, Cemmaes Terrace, Collett Road, and 109, Marlowes, Hemel Hempstead, Herts.—This debtor recently attended at the Court House, St. Albans, for his public examination. His statement of affairs disclosed ranking liabilities of £1,605, with assets of £369, leaving a deficiency of £1,235. He attributed his failure to illness, and to losses sustained through underestimating on contracts. The examination was adjourned.

H. L. Kinvig, electrician, 167, Jeffcock Road, Wolverhampton.—Receiving order made April 13th on debtor's own petition.

J. W. White, radio and electrical engineer, 32, Castledene Road, Parkstone, Dorset.—Discharge suspended until March 20th, 1934.

M. Tinner (Yorkshire Trading Co.), electrical factor, 91, Porter Street, Hull.—Last day for receiving proofs for dividend May 5th. Trustee, Mr. J. E. D. Stickney, 1, Parliament Street, Hull. Official Receiver.

Company Liquidations

Cecil Cooper & Co. (London), Ltd., electrical engineers and contractors, 14, Gloucester Road, S.W.—The company's creditors met on April 21st, at Winchester House, London, Mr. C. S. Cooper, one of the directors of the company, occupying the chair. A statement of affairs submitted showed ranking liabilities of £8,150 and after allowing £50 for preferential claims, net assets of £2,865, leaving a deficiency so far as the creditors were concerned of £5,286. The deficiency as regarded the shareholders was £14,442. It was stated that the greater part of the deficiency as regarded the shareholders was due to the writing down of the assets in the statement of affairs. The company had sustained two bad debts of substantial amounts, one relating to the equipment of a dog racing track, which belonged to a company now in compulsory liquidation. Questions were asked regarding the loan made by the company of £7,800, and the chairman said that it was advanced in connection with the purchase of certain land which was believed to be ripe for development. It was hoped to take electricity in bulk and distribute it over an area of rather more than 500 acres. If the estate had been developed, the investment would have been a good one, but very little building had been done; if the estate was nursed it would prove a valuable investment. A resolution was passed confirming the voluntary liquidation of the company, with Mr. W. A. J. Osborne, of Messrs. Corfield and Cripwell, Balfour House, Finsbury Pavement, E.C., as liquidator, with a committee.

Clarith Reproducers, Ltd., 76, East Street, Leeds.—At the recent statutory meeting of creditors a statement of affairs was submitted which showed liabilities of £1,998, all due to unsecured creditors, and assets totalling £681. After allowing £173 for preferential claims, the net assets were £508, leaving a deficiency of £1,491. A resolution was passed confirming the voluntary liquidation of the company with Mr. C. Latham (Radio and Gramophone Trades Guardian Association), 78, New Oxford Street, W., as liquidator, with a committee. The following are the principal creditors: Chorlton Metal Co., Ltd., £117; Concordia Electric Wire Co., £120; Electric Products, Ltd., £110; Erie Resister Co., Ltd., £128; W. H. Parker, £106; Telegraph Condenser Co., Ltd., £181; J. & H. Walter, £108; Wingrove & Rogers, Ltd., £208.

Central Wholesale Electrical Co., Ltd., 234, Upper Thames Street, E.C.4.—The statutory meeting of creditors was held on April 19th at Winchester House, London. Mr. J. Baker, of Messrs. Baker, Sutton & Co., submitted a statement of affairs which showed liabilities of £1,838, all due to unsecured creditors, and assets amounting to £1,071. After allowing £11 for preferential claims, the net assets were £1,060, leaving a deficiency with regard to creditors of £778. The issued capital of the company was £2,550, making a total deficiency of £3,328. The creditors decided to confirm the appointment of Mr. Baker as liquidator of the company, with a committee of inspection.

Chester Electrical Co., Ltd.—Winding up voluntarily. Liquidator, Mr. T. G. Williams, 26, Newgate Street, Chester.

Colley & Co., Ltd.—Winding up voluntarily. Liquidator, Mr. H. W. Blackburn, 76, Victoria Street, S.W.

Condenser Electric Co., Ltd.—Particulars of claims by May 15th to the liquidator, Mr. W. H. Cork, 19, Eastcheap, E.C.

Electrical & Wireless Equipment Supplies, Ltd.—Winding up voluntarily. Liquidator, Mr. R. Russam, 38, Piccadilly, Bradford.

Private Arrangement

C. Saville Jones, electrical engineer, 95a, Hall Lane, Armley, Leeds.—At a meeting of creditors a statement of affairs was submitted which showed liabilities of £507, all due to unsecured creditors, and assets of £217. The net assets amounted to £215, leaving a deficiency of £292. A resolution was passed in favour of a deed of assignment being executed to Mr. C. H. Baker, Standard Buildings, City Square, Leeds, together with a committee consisting of the representatives of Mr. F. Reynolds and the Sun Electrical Co., Ltd. The following are the principal creditors: General Electric Co., Ltd., £114; Fred Reynolds, £93; R. Saville Jones, £90; Sun Electrical Co., Ltd., £84.

Dissolution of Partnership

E. Horn & Son, radio and electrical engineers, 6, South Parade, Oxford.—Messrs. E. Horn and C. E. Horn have dissolved partnership. Mr. C. E. Horn will attend to debts and carry on the business.

Electricity Supply

Lighting, Domestic, Power

Allanton.—PUBLIC LIGHTING.—Lanarkshire County Council has accepted an offer made by the Coltness Iron Co., Ltd., to supply electricity for public lighting at Allanton.

Alston (Cumberland).—A SUPPLY COMING.—The Rural District Council has been notified that the Mid-Cumberland Electricity Co., Ltd., is to supply electricity to the town.

Barnes.—REDUCED CHARGES.—The Town Council has adopted the following reduced charges for electricity:—Lighting flat rate, from 2¾d. to 2½d. per kWh. Rateable value tariff: during the two summer quarters the "unit" charge to be ½d. instead of ¼d.; minimum charge reduced from 7s. 6d. per quarter, including meter rent, to 5s. per quarter, plus meter rent. Alternative tariff for shop lighting, 4s. 6d. per quarter for each 100 W installed, plus ½d. per kWh. Electric irons are to be supplied to consumers at 5s. each, or on hire-purchase terms at 1s. per quarter for six quarters.

Barnsley.—LIGHTING OF MARKET.—The Town Council has decided to carry out an electric lighting scheme at the wholesale market at a cost of £200.

Bath.—LOANS.—The Electricity Committee recommends that application should be made for sanction to loans of £20,000 for mains and services, £1,542 for laying a duplicate length of e.h.p. main across the Old Bridge and extending the existing e.h.p. main in the Lower Bristol Road, and £9,000 for meters and time switches.

Bexhill-on-Sea.—ELECTRICAL DEVELOPMENT SCHEME.—In view of the proposed extensions and further works which it is anticipated will be required in the near future, the Electricity Committee recommends that instructions should be given for the submission of a general development scheme for the undertaking to cover estimated requirements for a period of years.

Blackpool.—REMARKABLE PROGRESS.—A record number of new consumers (2,589, representing 8,637 kW) during the year ended March 31st last is reported by Mr. Charles Furness, the borough electrical engineer; the total number of consumers is now 25,796. Nearly 50 million kWh of electricity was sold, an increase of 2,400,000 kWh as compared with the preceeding year, and it is estimated that there will be a net surplus of £23,000 (£16,972 in 1931-32).

Bradford.—LOAN SANCTIONED.—The Corporation has received sanction to the borrowing of £20,000 for estimated expenditure on transformers and sub-station switchgear during the next three years.

Brampton (Westmorland).—ELECTRICITY FOR WALTON.—At a recent meeting of the Rural District Council, a petition was received from the inhabitants of Walton asking the Council to urge the Carlisle Electricity Department to extend its cables to provide electricity for Walton and the adjoining district. It was decided to support the petition.

Bridlington.—LOAN SANCTIONED.—The Town Council has received sanction to a loan of £4,000 for mains and services.

Brighton.—MAINS AND SERVICES.—The Electricity Committee recommends that application should be made for sanction to the borrowing of £100,000 for anticipated expenditure during the next two years on general mains extensions and house services. The electrical engineer has been authorised to extend mains along various thoroughfares in Brighton, Portslade, Southwick and Fishergate at a cost of £1,300, and it is proposed also to provide supplies to the building estate north of Carden Avenue, Patcham (£3,357), and to Southdown Road, North Portslade (£3,100).

NEW SUB-STATION.—A new sub-station, costing £4,000, to augment the supply in the western area is to be erected in Western Road.

CHANGE-OVER.—At a cost of £6,280, apparatus is to be purchased for the change-over from d.c. supply to a.c. in the North Moulsecombe area.

PULVERISING EQUIPMENT.—In view of the repairs necessary to place the pulverising equipment for the generating station boiler into commission again, the Committee has approved a proposal to contribute the money required towards the cost of changing the system from the bin and feeder method to the direct fired method, at an estimated cost of £2,500.

STREET LIGHTING.—It is proposed to extend the central suspension scheme of lighting from the south gates of Preston Park to Preston Circus at a cost of £450.

COOKER HIRING SCHEME.—A scheme for the assisted hiring-out of cookers and other electrical apparatus is to be given a six months' trial.

Burnley.—FRINGE ORDER.—The Rural District Council has been asked to consent to a Fringe Order to enable Rawtenstall Corporation to supply electricity to Dunnockshaw.

Cheshire.—TARIFF REDUCTIONS.—Mid-Cheshire Electricity Supply Co., Ltd., has reduced its lighting flat rate from 9½d. to 8d. per kWh. In cases where consumers charged under the contract system have a demand which justifies a meter rent under the present schedule exceeding 2s. 6d. per quarter, the meter rent charged will be limited to that figure.

Chester.—MAINS AND SERVICES.—The Electricity Committee is to apply for sanction to a loan of £50,000 for mains and services in connection with extension schemes.

SWITCHGEAR.—Sanction has been obtained to the borrowing of £393 for the provision of switchgear for the distribution chamber in Victoria Place.

DEVELOPMENT OF UNDERTAKING.—The Electricity Committee has received a deputation from the Chester and District Chamber of Trade upon matters concerning the development of the undertaking, including the work of the electricity showrooms and wiring department, and submitting its views upon these matters. The question is to be considered at the next meeting of the Committee.

Congleton.—MINIMUM CHARGES.—The Town Council has adopted a minimum charge of 5s. per quarter for power consumption for domestic appliances, including wireless sets and reading lamps. The charge will be in addition to the meter rent.

Croft (Yorks).—EXTENSIONS.—Inquiries are to be made with regard to the possibility of extending the Darlington Corporation's electricity supply to Cleasby, Stapleton, and Barton.

Croydon.—LOANS SANCTIONED.—The Town Council has received sanction to loans of £11,400 for electricity services and £20,000 for house-wiring installations.

Dundee.—CAPITAL EXPENDITURE ON CAROLINA PORT.—The Central Electricity Board and the Corporation Electricity Department has reached an agreement regarding the capital expenditure attributable to generation at the Carolina Port station. The agreed amount is £346,310, with an additional £8,778 for capital expenditure paid out of revenue.

Durham.—SCHOOL LIGHTING.—The Board of Education has sanctioned the installation of electric lighting in the following schools: Blackhall Colliery, Hamsterley Colliery, Hetton-le-Hole, Billingham Council (portable buildings only), and Bloemfontein Council Schools (portable buildings only).

Ealing.—REWIRING OF VICTORIA HALL.—The Corporation has asked the borough electrical engineer to submit schemes for the rewiring of Victoria Hall.

Eastbourne.—REVISION OF HIRE AGREEMENTS.—The Electricity Committee has reduced the minimum period for the hire of domestic apparatus from three to two years.

Edinburgh.—FLOODLIGHTING OF GARDENS.—The flood-lighting of Princes Street Gardens is being considered by a committee of the Corporation.

Glasgow.—THE DALMARNOCK STATION.—The Electricity Committee is to protest to the Central Electricity Board against the proposal to restrict the output of electricity at Dalmarnock power station. The Board at first decided to restrict the output by 70,000,000 kWh per annum, and to "import" a similar quantity from outside stations. This was objected to by the Electricity Committee, and following a conference with members of the Board, the restriction was modified. It is now suggested, however, that the Dalmarnock output should be reduced by 20,000,000 kWh per annum, and that a similar quantity should be supplied from outside stations for consumption in Glasgow. The Committee takes the view that the station is the most economical one in Scotland, and that it ought to be kept in continuous production. The Board is insisting that before it comes to a final decision tests should be made as to the relative economy of production at Dalmarnock and other stations.

Glossop.—ELECTRICITY CHARGES.—The Electricity Commissioners have suggested that the Corporation should appoint a deputation to meet representatives of the Urban Electric Supply Co., Ltd., before taking any further action in regard to electricity charges, and the General Purposes Committee has agreed to this proposal.

Glynhir and Pentrebach.—EXTENSIONS.—Underground cables are being laid by the Gorseinon Electric Light Co., Ltd., from Pontardulais to Glynhir and Pentrebach, and it is anticipated that public lighting will be installed next winter.

Great Yarmouth.—SPECIAL ORDER.—With reference to the Corporation's application for a Special Order to supply the Lowestoft area south of Kessingland, it is suggested that the Council should apply also for powers to supply the parish of Henstead, which is at present included in the area of the East Anglian Electric Supply Co., Ltd.

Greenock.—GENERATION OF ELECTRICITY AT GASWORKS.—Considerable interest is evinced in a proposal to generate electricity at Inchgreen gasworks, which is to be discussed by a committee of the Corporation. Gas from low-temperature carbonisation is stated to be practically waste at present, but with the addition of an electric power house this could be utilised.

Howden.—PROSPECTS OF SUPPLIES.—A canvass of prospective consumers is being made by the North Lincolnshire & Howdenshire Electricity Co., Ltd., and electricity will shortly be available, the lighting rate being 7d. per kWh (quarterly meter rent 1s. 6d.) with a minimum yearly charge of £2.

India.—HYDRO-ELECTRIC DEVELOPMENT IN NEPAL.—The Nepal Government has undertaken the construction of hydro-electric plant at Sunderjal, about ten miles from Katmandu, for supplying new mills and factories there. A new telephone scheme is also under construction.

ELECTRICITY FOR KOLHAPUR.—The Kolhapur Government is to carry out a hydro-electric scheme to provide power for several engineering concerns. At Radhanagri there is a large reservoir in the neighbourhood of high mountains where a

head of 1,200 ft. is available. Mr. Latimer, an English hydro-electric expert, is to examine the scheme and the work will be carried out according to his proposals. About 50,000 h.p. will be produced.

THE PYKARA SCHEME.—Three districts, eight towns, and three villages are already being supplied with lighting and power by the recently inaugurated Pykara Scheme, while industrial plant amounting to 5,000 and 6,000 h.p. is about to be electrified. These loads are distinctly encouraging, and Government has therefore decided on two extensions not contemplated in the original scheme, namely, to Cochin and Trichinopoly. If the present progress is maintained, there is every prospect of reaching, in the sixth year of operation, the return expected in the tenth year.

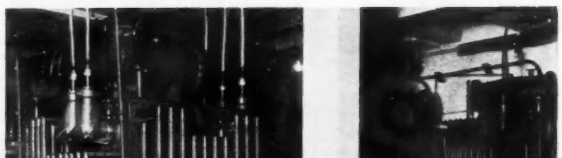
Keighley.—SUB-STATION EQUIPMENT.—The Electricity Committee has obtained sanction to the borrowing of £6,000 for sub-station equipment.

Kettering.—ELECTRICITY FOR GREAT OAKLEY.—The Electricity Committee is to apply for sanction to the borrowing of £449 for the provision of cables to supply Great Oakley.

King's Lynn.—ELECTRICITY FOR MARSHLAND.—The Corporation proposes to apply for an Order authorising it to supply electricity in Terrington St. Clement, Clenchwarton, and other parts of Marshland. The district in question is at present in the supply area of the East Anglian Electric Supply Co., Ltd., and the company is in favour of the proposal.

Langholm.—STREET LIGHTING.—The Town Council has accepted the tender of the Dumfries County Council Electricity Department for the lighting of the streets by electricity at a cost of nearly £800.

London.—THE CATERHAM UNDERTAKING.—The Electricity Commissioners have announced with regard to the application of the London & Home Counties Joint Electricity Authority for consent to acquire the Caterham and Woldingham under-



Transformers in Eagle Street sub-station **(see page 589)**

takings of the Urban Electric Supply Co., Ltd., that the case for the giving of consent was not made out by the Joint Authority to the satisfaction of the Commissioners, who have accordingly notified the Authority of their refusal of consent. The application was opposed by the County of London Electric Supply Co., Ltd., and a number of local authorities.

ISLINGTON.—The Electricity Committee is to replace further rubber-covered mains at a cost of £5,400.

BATTERSEA.—The Electricity Committee is to provide electricity services to 172 premises at an estimated cost of £1,395.

Louth.—CHEAPER ELECTRICITY.—Reductions in electricity charges are announced as follows:—Lighting flat rate, from 8d. to 6d. per kWh. Lighting prepayment rate, from 9d. to 7d. Power, from 3d. to 2½d. Heating and cooking, from 3d. to 1½d. in the summer and 2d. in the winter. Maximum demand tariff, from £16 to £13 10s. per kWh, with a "unit" charge of 1d. Domestic tariff, from 16s. to 12s. per room, plus 1d. per kWh consumed; the size of rooms for which this tariff is available has been limited, and an increased rate charged for rooms exceeding 25 sq. yd. Reductions have also been made in minimum charges and in meter rents. The lowering of the charges is due partly to a decision to use electricity instead of steam at the municipal waterworks.

Luton.—COOLING TOWER AND CONVERTING PLANT.—The Electricity Committee proposes to spend £12,273 on a cooling tower and £11,459 on converting plant.

Mansfield.—SUPPLY IN NOTTINGHAM ROAD.—The Electricity Committee has approved the provision of a h.p. feeder, sub-station, and l.p. distributing mains in Nottingham Road, at an estimated cost of £846.

Plymouth.—BEACH LIGHTING.—The floodlighting of the bathing beaches, etc., on the Plymouth foreshore, which proved such an attractive feature last season, is to be resumed in July next and an elaborate scheme for illuminating the Hoe is also being prepared.

Preston.—MAINS EXTENSIONS.—The Electricity Committee is extending mains at Wrea Green (£320); Cumeragh Lane, Longridge (£175); Sharoe Green Lane, Broughton (£1,241); Green Man, Brock (£1,176); Church Lane (Salwick), £189; and Liverpool Road, Howick (£3,761).

Scarborough.—EXTENSION SCHEME.—The Town Council is considering a proposal for extending its electricity supply to Wykeham and Ruston.

Seaham Harbour.—SCHOOL HEATING.—Durham County Education Committee is to ask the Board of Education for permission to heat the new buildings at the Seaham Intermediate Council Schools by electricity.

Selsdon.—NEW SUB-STATION.—The County of London Electric Supply Co., Ltd., is to erect a sub-station in Arundel Avenue.

Slough.—REDUCED CHARGES.—The Slough and Datchet Electric Supply Co., Ltd., has reduced the "unit" charge under the all-in tariff from 1d. to ¾d., and there is a new rate for shop lighting from 7 p.m. until midnight of 1d. per kWh.

Southam.—EXTENSIONS.—The Leamington and Warwick Electrical Co., Ltd., is to provide mains at Priors Marston and Northend.

Southend-on-Sea.—ILLUMINATION SCHEME POSTPONED.—The scheme for illuminating the front is to be postponed until next year as the Electricity Commissioners have stated that it would not be in accordance with practice to sanction a loan for the purpose.

LOANS SANCTIONED.—The Town Council has received sanction to loans of £3,115 for transformer stations and £20,000 for unspecified mains.

ENCOURAGING THE DOMESTIC LOAD.—A recommendation by the Electric Lighting Committee with a view to encouraging the installation of wiring for domestic purposes other than lighting in new houses, the builder to pay half the cost (£5 3s.) on completion of the work and the balance to be paid by the builder, purchaser, or tenant when the installation is put into service, has been referred back for reconsideration.

SUCCESS OF RECENT EXHIBITION.—The net expenditure in connection with the recent exhibition was £960. Sales of apparatus and wiring installations on hire-purchase terms amounted during the exhibition to £1,988.

MAINS EXTENSIONS.—The following mains extensions have been authorised: Canvey Road to new station at Leigh, £1,632; Thames Drive to Braemar Crescent, £737; Hamlet Court Road North, £321; Highlands Boulevard, £273; Eastwood Boulevard, £550; and spur to Southend Stadium, £681.

Stafford.—MINIMUM CHARGES.—The Town Council has decided that the minimum charge of 5s. per quarter (adopted at the March meeting) shall be applicable to domestic consumers only.

EXTENSIONS.—Mains are to be extended to the New Common housing site, and continued to Eccleshall Road at an estimated cost of £700, and a supply is to be given to Messrs. Chance and Hunt, Ltd. (£310).

Stokesley (Yorks).—ELECTRICITY FOR INGLEBY ARNCLIFFE.—The question of supplying electricity to Ingleby Arncliffe is being considered by the Rural District Council in conjunction with the local supply company.

Swansea.—EXTENSIONS.—The Electricity Committee is to lay an e.h.p. main from Fleet Street sub-station to the Civic Centre at an estimated cost of £2,462, and carry out general mains extensions at a cost of £467.

Todmorden.—EXTENSIONS.—The Electricity Committee is to supply electricity to property in Bacup Road at an estimated cost of £160.

Tregaron.—SPECIAL ORDER.—At a recent meeting of the Rural District Council the Electricity Commissioners intimated that they had dispensed with the Council's consent and had submitted an Order to the Ministry of Transport for confirmation. It was decided to send a protest to the Ministry of Transport if no guarantee was given that the Commissioners would ensure a supply for the district within three years.

Uxbridge.—FURTHER PRICE REDUCTIONS.—The Uxbridge & District Electric Supply Co., Ltd., is reducing the "unit" charge of the all-in tariff from 1d. to ¾d. in the Buckinghamshire area. There will also be a new rate of 1d. per kWh for late shop-window lighting.

Wallasey.—DISTRIBUTION IN DOCK ROAD AREA.—The Electricity Committee has obtained sanction to the borrowing of £10,608 for works in connection with the reconstruction of the distribution system in the Dock Road area.

FRINGE SUPPLIES.—Application is being made by the Electricity Committee for permission to supply electricity to parishes in the Wirral rural district, which have been transferred to the borough and are at the moment in the area of the Birkenhead Corporation.

Walsall.—PREPAYMENT METERS.—The Electricity Supply Committee has approved the use of penny prepayment meters.

Warwickshire.—LIGHTING OF POLICE STATIONS.—The Standing Joint Committee has decided to install electric lighting at a number of village police stations and houses at a cost of £264.

Weymouth.—LOANS.—The Town Council has applied for sanction to loans of £25,000 for mains and services, and £5,000 for sub-station equipment.

EQUIPMENT OF SHOWROOMS.—A sub-committee has been appointed to purchase fittings and equipment for the proposed electricity showrooms.

Whitehaven.—MAINS EXTENSIONS.—The Town Council has decided to extend mains to the Woodhouse No. 2 Housing Estate at a cost of £500.

Wood Green.—STREET LIGHTING.—At a recent meeting of the Highways Committee the surveyor reported that in his opinion the public lighting of the main roads was far from satisfactory. It was decided that the North Metropolitan Electric Power Supply Co. and the Tottenham and District Gas Co. should be invited to submit schemes for lighting improvements and arrange for specimen lamps to be erected in the High Road.

Woodhall Spa.—SUPPLY DELAY.—The Urban District Council is to ask the Mid-Lincolnshire Electricity Co. for a definite date when electricity can be expected for the Spa, and to call attention to the delay in the matter.

Ystradgynlais.—PURCHASE SCHEME DEFERRED.—At a recent parish meeting it was decided to defer consideration of the Rural District Council's proposal to purchase the local supply undertaking from the Glantawe Electric Supply Co.

Traction

Barnes.—TRAFFIC SIGNALS.—It is proposed to install traffic control signals at the corner of Barnes Common and Roehampton Lane at a cost of £916.

Blackburn.—TRANSPORT MERGER PROPOSAL.—A proposal to form a transport board for the Blackburn, Accrington, and Darwen area is being considered by the Transport Committee.

France.—BATTERY-OPERATED RAILCARS.—After extensive trials, the metre-gauge South-Western Railway has acquired six large railcars, the motors of which are supplied with electricity from storage batteries. The cars are intended for operation on country lines out of Toulouse, and contain eight sets of "Tudor" batteries of 800-Ah capacity, these being sufficient for a run of 68 miles without recharging. The four traction motors total 200 h.p., the maximum speed being 40 m.p.h.

DIESEL-ELECTRIC LOCOMOTIVE EXPERIMENTS.—The first 600-h.p. Diesel-electric locomotive in France has recently been put in service on the Paris, Lyons, and Mediterranean Railway; it is stated to be the largest engine of its kind in use in the country. The P.L.M. Railway Co. is shortly putting in service two additional Diesel-engined machines of different types with which comparative tests are to be carried out.

Germany.—RAILWAY ELECTRIFICATION.—*Modern Transport* states that electric traction will be brought into operation on the German National Railways line between Augsburg and Ulm on May 15th, and on the section from Ulm to Stuttgart in June or July. This will complete the electrification of the whole of the line between Munich and Stuttgart, and bring the total electrified mileage of the German railway system up to 1,180 miles.

Leicester.—BOW COLLECTOR EXPERIMENTS.—Experiments with a bow collector are being carried out on one of the Corporation trams.

London.—TRAFFIC CONTROL EXPERIMENT.—*The Times* states that an experiment was recently carried out to test the cost of vehicular-controlled regulating apparatus, in comparison with mechanism worked on a basis of fixed time intervals. The point selected was at the Gracechurch Street, Cornhill, Bishopsgate, Leadenhall Street crossing, where traffic flow readings were taken on a Saturday from 11.15 a.m. to 12.15 p.m., and a traffic count showed 1,280 vehicles in the hour. Over 590 of these were north-south, while the balance was east-west, showing that the inter-section is most evenly travelled. Careful examination of the figures and comparative calculations showed that there was a saving by vehicular control, as compared with fixed time apparatus, of about £3,700 per annum in vehicle hours, a vehicle hour being taken as 5s. A striking point about the readings was the surprising difference between the number of vehicles dealt with at a time by the apparatus. While as many as fifty passed the crossing during one flow, only ten went over on at least one occasion, this being regarded as an excellent test of the flexibility of the apparatus.

WANDSWORTH.—The Borough Council is to install traffic signals at the junction of Wandsworth Road, Queen's Road, Lavender Hill, and Cedars Road at a cost of £358.

Newcastle-on-Tyne.—DIESEL-ELECTRIC TRACTION.—The first Diesel-electric train service introduced in Great Britain has just completed its first year's operation. Sir W. G. Armstrong Whitworth & Co., Ltd., in a report on the performance of the "Tyneside Venturer," built by them, which is operating the service, state that during the twelve months the car has travelled 50,000 miles, while its total fuel and lubrication costs have amounted to only £166. The total fuel and lubricating costs per train mile work out at 0.8d.

Poland.—RAILWAY ELECTRIFICATION.—According to a Berlin report, representatives of an English group, with which the Prudential Assurance Company is associated, are expected in Warsaw with regard to the provision of 60 to 70 million zloty for the electrification of the Warsaw railway system.

South Africa.—CAPETOWN-BELLVILLE RAILWAY ELECTRIFICATION.—According to the *Railway Gazette*, the work of electrifying the double line from Capetown to Bellville is to be commenced at the beginning of next month. It will cost about £60,000, of which £20,000 is to be borne by the Electricity Supply Commission. The length of line to be electrified is twelve and a half miles, and a ten-minute service of trains will be possible. The system will be equipped with three-colour light signalling.

Wallsend-on-Tyne.—TRAFFIC CONTROL.—The Town Council is to consider the question of installing traffic signals at the junction of Coast Road and Station Road.

Communications

France.—RADIO TAXES.—One of the articles of the Finance Bill which was adopted by the Chamber on April 15th provides for radio taxation on the following scale: Crystal receiving sets 15 fr., private valve sets 50 fr., valve sets used in public 100 fr., and valve sets used in places to which public admittance is by payment 200 fr.; valves will be taxed 15 per cent. on their sale price. The Minister of Posts and Telegraphs has given formal assurance that the revenue derived from the new taxation will be devoted entirely to the improvement of broadcasting and the suppression of electrical interference therewith. He also announced that a new statute governing the general conditions of broadcasting would be drawn up in the near future.

Great Britain.—RADIO RELAY EXCHANGES.—Ayrshire Wireless Service, Ltd., Kilmarnock, has applied to the Galston Town Council for permission to establish a relay service in the borough.

The Cumnock Town Council has given permission to Ayrshire Wireless Service, Ltd., to establish a service in the town.

Broadcast Listeners' Services, Ltd., London, has applied to the Linthwaite Urban Council for permission to establish a service.

The Birkenhead Corporation Roads Committee is to consider an application from Mr. R. Ingham, of Burnley, for permission to install a service within the borough. Rediffusion, Ltd., has asked for its application to be reconsidered.

India.—BEAM TELEPHONY.—The Government of India expects to inaugurate a beam radio-telephone service between Bombay and England on May 1st, to operate for four hours daily, and to be extended later to other parts of India.

TELEGRAPHY AND TELEPHONY.—The report of the Indian Posts and Telegraphs Department for the year 1931-32 shows that at the end of the year the department was maintaining 106,000 miles of line carrying 498,700 miles of wire, 1,200 miles of cable, and 84,000 miles of conductors; 17,170,000 inland and foreign telegrams were dealt with, giving a revenue of Rs. 2.02 lakhs, while the telephone revenue was Rs. 57.46 lakhs. Communication between India and Burma is maintained departmentally by three routes. One is a land line round the coast of the Bay of Bengal, the second is a land line through Assam, and the third a high-speed wireless circuit between Madras and Rangoon. Communication between the general telegraph system of the country and the Andaman Islands is maintained solely by wireless links. The Baudot system is used for all high-speed telegraph work, except in the case of the Madras-Rangoon wireless link, which is worked on the Wheatstone system. Telephone trunks now connect most of the chief towns in Upper India, including those north of the line between Calcutta and Bombay. The Department itself works nearly all the local telephone systems in the various towns throughout the country and at Aden. In the case, however, of Bombay, Ahmedabad, Karachi, Calcutta, Madras, Rangoon, and Moulmein, local telephone requirements are provided almost entirely by private companies working under licences issued under the Telegraph Act, one of the conditions of each licence being the payment to the Department of a royalty at the rate of 5 per cent. of the company's gross earnings.

BOMBAY TELEPHONE PROGRESS.—The Bombay Telephone Company declared a dividend of 7 per cent. for the year 1932. The total increase in exchange and private lines was 688, a figure which has not been approached since 1923. Of this total, 60 per cent. represents business lines and the balance residential or party lines. The party line and instalment payment systems have steadily increased in popularity. The company proposes to carry out various programmes which have long had to be held up owing to the unfavourable economic conditions.

Spain.—NEW RADIO STATION.—A new 100-kW radio station costing £100,000 is to be erected shortly in Madrid, according to an announcement by the Spanish Home Office. The existing station is run by a private concern, but the new one will be entirely under State control. Income from licences will go to defray the cost of construction.—*Reuter* (Madrid).

Watchet.—NEW BROADCASTING STATION.—The new West Regional station of the B.B.C. at Watchet, or Washford Cross, near Minehead, commenced transmission for reception tests on April 24th. The old Cardiff station's wavelength of 309.9 metres is being used, and it will probably become the West Regional wavelength. Later the Watchet National transmitter will be synchronised with the London National transmitter on the 261.6 metres wavelength. The Cardiff studio is being enlarged, that at Swansea will continue to be used, and another is being equipped at Bristol. The Plymouth transmitter will continue to be utilised.

Contract Information

When "Contracts Open" are advertised in our "Official Notice" pages the date of the "Electrical Review" containing the advertisement is given in parentheses below

Contracts Open

Argentine.—Buenos Aires.—June 19th. Ministry of Public Works. Hydro-electric plant, including turbo-generators, Diesel-electric generators, transformer, switchboards, accessories, spares and tools. (A.X. 11767.)*

Australia.—Melbourne.—June 7th. City Council. One of two boiler units. (G. 12425.)*

May 23rd. Posts and Telegraphs Department. Submarine cables (A.X. 11763)*, telephone protective apparatus (A.X. 11764)*, and v.i.r. lead covered cable (A.X. 11765).*

Sydney.—June 14th. N.S.W. Department of Railways. 500-kW turbo-alternator for Zarra Street power station. (A.X. 11762.)*

May 29th. Municipal Council. 50-kV pin and strain type insulators. Constructional Engineer's Office, Electricity Department, St. Andrew's Place, Sydney (deposit £1).

June 6th. Current differential transformers. Constructional Engineer's Office, Electricity Department (preliminary deposit £30).

Cardiff.—May 16th. Electricity Department. E.h.p. and l.p. paper-insulated cables. (April 21st.)

Cheadle and Gatley.—May 12th. Electricity Department. 200-kVA oil-cooled static transformer. (See this issue.)

China.—Government Purchasing Commission. 2,000-kVA synchronous condenser, with exciter, &c. (See this issue.)

Cleethorpes.—May 8th. Electricity Department. L.p. cables. (See this issue.)

May 22nd. Sub-station equipment.

Deptford.—May 3rd. Town Council. Lamps. (March 31st.)

Dover.—May 12th. Electricity Department. Meters. (See this issue.)

Dumfries.—May 8th. County Council. Transformers. (April 21.)

Edinburgh.—May 8th. Corporation. X-ray apparatus and auxiliary equipment at the Western General Hospital. Medical officer, Johnston Terrace.

Egypt.—Cairo.—May 15th. Ministry of the Interior. Waterworks equipment. (G.X. 12464.)*

Folkestone.—Town Council. Electric wiring installation in thirty-two houses. Borough engineer.

Halifax.—May 1st. Corporation. Electrical work in connection with out-station house. Mr. D. T. Lloyd Jones, borough engineer, Crossley Street, Halifax (deposit £1 1s.).

Hamilton.—April 29th. Corporation. Wiring and fittings for lighting and heating of the Mausoleum Cottage, Palace Grounds, Hamilton. Town clerk.

Electricity Department. 500-kVA transformer. (April 21st.)

India.—Lahore.—May 1st. North Western Railway. Welding electrodes. (A.X. 11768.)*

Irlam.—May 15th. Urban District Council. Street lighting poles. (See this issue.)

Kirkcudbright.—May 17th. County Council. 11-kV overhead and underground distribution lines. (April 21st.)

Lanark.—May 2nd. County Council. Various works, including electric lighting, at housing scheme. Mr. P. C. Smith, county housing and town planning engineer, 13, Cyldesdale Street, Hamilton.

London.—Holborn.—May 16th. Borough Council. Automatic traffic control signals. (April 14th.)

St. Marylebone.—May 2nd. Electricity Department. L.p. and e.h.p. underground cables. (April 21st.)

Manchester.—May 5th. Electricity Department. Supervisory control gear and boiler house vacuum cleaning plant. (April 14th.)

May 12th. De-superheater plant for Stuart Street power station. (See this issue.)

Middlesbrough.—May 3rd. Electricity Department. Cables and meters. (April 21st.)

New Zealand.—Wellington.—June 6th. Post and Telegraph Department. 100 miles of v.i.r. insulated wire. (A.X. 11770.)*

Dunedin.—May 24th. Corporation Tramways. 880 yd. of feeder cable. (A.X. 11769.)*

Oswestry.—April 29th. Electricity Department. L.p. distributors. (April 21st.)

Salford.—May 10th. Electricity Department. 33-kV feeders for l.p. pilot cable. (See this issue.)

May 1st. Transformer and metal-clad switchgear panels. (April 7th.)

South Africa.—Pretoria.—May 19th. Government Supplies Board. Telephone terminal blocks and outdoor distribution boxes (A.X. 11775)*, and pole bases, lightning rods, screw rings, tape, &c. (G.X. 12516).*

Southern Rhodesia.—Salisbury.—June 6th. Municipal Council. Turbo-alternators, switchgear, cable, and transformers. (A.X. 11771.)*

Swansea.—Education Committee. Electrical installation at Oxford Street school.

West Riding.—May 9th. Education Committee. Installation of electric lighting at new schools at North Elmsall and Hoyland. Education officer, County Hall, Wakefield.

*Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Contracts Closed

Acton.—Housing Committee. Accepted. Wiring Council houses (£2,546).—Page & Girling. (In lieu of withdrawn tender.)

Highways Committee. Accepted. Electric vehicle battery (£578).—Edison Storage Battery Distributors, Ltd.

Ashford (Kent).—Guardians' Committee. Accepted. Installation of electric lighting at Hothfield Casual Wards (£94).—G. Wallis & Son, Ltd.

Government Contracts.—The following contracts were placed by the various Government departments during March:—

Admiralty (Contract and Purchase Department).

Amplifiers.—Marconi's Wireless Telegraph Co.
Tuner amplifiers.—Radio Instruments, Ltd.
Electric travelling crane.—J. Adamson & Co.
Generating set.—Crossley Bros.
Switchgear.—Allen West & Co.
Wireless valves.—G.E.C.

War Office.

Electric cords.—Enfield Cable Works.
Electric lamps.—B.T.-H. Co.; Stella Lamp Co.; G.E.C.; Cryselco.
X-ray apparatus.—Watson & Sons (Electro-Medical), Ltd.

Air Ministry.

Direction finding station.—Marconi's.
Motor generators.—Haslam & Newton; Rotax.
Motor generators and brushes.—Small Electric Motors.
Sound film.—B.T.-H. Co.

Crown Agents for the Colonies.

Cable.—B.I. Cables; Brown Lenox & Co.; Callender's.
Switchboards.—English Electric Co.
Telephone equipment.—Standard Telephones & Cables.
Wireless materials.—A. Lyon & Co.

Post Office.

Telegraphic apparatus.—Creed & Co.
Telephonic apparatus.—Automatic Electric Co.; Bonnella Bros.; G.E.C.; Hall Telephone Accessories; Siemens Bros.; Standard Telephones & Cables; Telephone Mfg. Co.
Testing and protective apparatus.—G.E.C.; Phœnix Telephone & Electric Works.
Service boxes.—Venner Time Switches.
Cable.—B.I. Cables; Callender's; Connollys (Blackley); Hackbridge Cable Co.; Henley's; Siemens Bros.; Standard Telephones & Cables.
Telephone cords.—Reliance Elecl. Wire Co.
Electric light fittings.—Hailwood & Ackroyd.
Secondary cell parts.—Alton Battery Co.; Britannia Batteries.
Rectifiers.—Westinghouse Brake & Saxby Signal Co.
Thermionic valves.—G.E.C.; Standard Telephones & Cables.
Armoured cable-laying, London-Ashford.—Standard Telephones & Cables.
Replacement of negative battery plates, National telephone exchange, E.C.—Alton Battery Co.
Cabling, loading coils, and terminations, London-Ashford.—Standard Telephones & Cables.
Electric lighting, Mount Pleasant new letter office, E.C.—A. Hawkins & Sons.
Telephone exchange equipment.—Foxhall (Ipswich); Ipswich; Torquay; Gloucester; Blackburn: Automatic Electric Co. London trunk exchange; Aberdeen trunk and local exchange; Bermondsey; Tilehurst, Spencer's Wood, Earley and Caversham (Reading): Standard Telephones & Cables. Cardiff trunk exchange: Ericsson Telephones. Sub-contractors: Pritchett & Gold & E.P.S. Co. for batteries; Crompton Parkinson for motor generators; Electric Construction Co. for ringing machines. Canonbury (London, N.): Ericsson Telephones. Sub-contractors: Pritchett & Gold & E.P.S. Co. for batteries; Electric Construction Co. for motor generators and ringing machines. Maida Vale: Siemens Bros.
Telephonic repeater equipment.—Tavistock: G.E.C.
Transformers, switchgear and cables.—Mount Pleasant sub-station, E.C.—B.T.-H. Co.

London.—Battersea.—Electricity Committee. Accepted. Alteration to switchgear at premises of Projectile & Engineering Co., Ltd. (£124).—Ferguson, Pailin, Ltd.

St. Marylebone.—Electric Supply Committee. Recommended. Replacement of steel tube economisers in two boilers (£2,920).—Babcock & Wilcox, Ltd.

Scarborough.—Town Council. Accepted. Kiosk (£376).—Metropolitan-Vickers Electrical Co., Ltd. Transformer (£233).—Brush Electrical Engineering Co., Ltd.

Southend-on-Sea.—Town Council. Accepted. Conversion of crane motors on Bell Wharf from d.c. to a.c. (£303).—W. Jay.

Weymouth.—Town Council. Accepted. Installation of electric lighting in connection with the Harbour (£556).—W. O. Knell.

Forthcoming Events

The National Register of Electrical Installation Contractors.—Friday, April 28th. Institution of Electrical Engineers, W.C. 2.30 p.m. Annual general meeting.

Electrical Industries Benevolent Association.—Friday, April 28th. Institution of Electrical Engineers, W.C. 4 p.m. Annual meeting.

Junior Institution of Engineers.—Friday, April 28th. Hotel Metropole, W.C. 6.45 for 7.15 p.m. Annual dinner.

Birmingham Electric Club.—Friday, April 28th. Grand Hotel, Birmingham. 7 p.m. "Review of Modern Power Station Design." Mr. T. E. Boothby.

Electrical Association for Women.—May 3rd, 4th and 5th. Birmingham Annual Conference.

Institution of Electrical Engineers.—(*Wireless Section*).—Wednesday, May 3rd. Institution, London. 6 p.m. "The Single Side-Band Method Applied to Short-Wave Telephone Links." Mr. A. H. Reeves. (*Meter and Instrument Section*).—Saturday, May 6th. Visit to Hampton Court and the National Physical Laboratory.

Royal Institution.—Friday, May 5th. Institution, London. 8.30 p.m. Conversazione.

Association of Supervising Electrical Engineers.—Saturday, May 6th. Visit to the works of Messrs. Gillett & Johnson, Ltd., Croydon.

Notes

Plastics and What They Are

The first of twelve free lectures which are being delivered at 4.30 p.m. on Wednesdays in the lecture theatre of the Science Museum, South Kensington, every week during the Plastics Exhibition was by Mr. H. V. Potter, who is chairman of the Plastics Group of the Society of Chemical Industry. Mr. Potter pointed out that, although it is comparatively new, the plastics industry represents a turnover of £20,000,000 and employs many thousands of persons. He was sure that it would play a very important part in the industries of the country, as the artist, the architect, and the engineer had available for their use a new material of great possibilities.

The lectures deal with the materials and processes available for plastic moulding, and on June 28th Lieut.-Col. K. G. Maxwell will lecture on their use in the electrical industry. The exhibition has attracted a considerable attendance.

A Warmed Screen for Cars

During the Monte Carlo Rally several cars used the Trico-Folberth hot screen to combat the exceptionally bad weather conditions. It comprises a sheet of glass surrounded by a rubber frame, supported by two arms fastened to the top of the car above the windscreen. When not in use, the pilot glass folds up parallel with the car roof. To put it into operation, the arms are brought down, placing the pilot glass flush with the screen inside. The action automatically makes and breaks the circuit of two heating elements. Two wires are stretched between the sides of the pilot glass and, immediately

The Trico-Folberth screen used by Mr. M. D. Scott, of Marryat & Scott, in the Monte Carlo Rally

the current is switched on, these two heating elements warm the screen, melting any fog, frost, sleet or ice that is frozen on the outside. The windscreen wiper is then brought into action, clearing the screen from the outside. The size of the pilot glass is 7 in. by 13½ in. and there are models for use with 6- and 12-V accumulators.

Institute of Transport Summer Meeting

In substitution for the tour of inspection of Austrian transport undertakings, which has been abandoned, a summer meeting of the Institute of Transport will be held on board the liner *Homeric*. During the voyage (June 3rd to 17th) four papers will be read and discussed.

Mining Electrical Engineers' Convention

The annual convention of the Association of Mining Electrical Engineers will be held from June 26th to June 30th at Blackpool.

The E.A.W.

A three-days' training course of lectures for women demonstrators and saleswomen commenced at the E.A.W. headquarters on April 26th.

A party of 400 members from London, Cheltenham, Rugby, Gloucester, and Cardiff visited the Ideal Home Exhibition on April 24th as the guests of the British Electrical Development Association.

The Kearsley Power Station of the Lancashire Electric Power Co. was visited by members of the Farnworth branch of the Association on April 20th. Mrs. Hutchinson, president of the branch, on behalf of the visitors, thanked the company, and Mr. M. H. Adams, generating engineer, responded.

Municipal Tramways Conference

The annual conference of the Municipal Tramways and Transport Association will be held at Blackpool on June 21st.

Safety Congress

This year's congress of the National Safety First Association will be held in London next month. The afternoon session on May 25th will be a joint one with the British Electrical Development Association, and will be devoted to "Electricity and its safe use in everyday life."

Educational

MANCHESTER SCHOLARSHIPS.—The Manchester City Council is again offering a number of scholarships tenable in the Faculty of Technology of the University of Manchester. Successful candidates are required to follow a full-time course leading to the degree of bachelor of technical science in the College of Technology, and matriculation, or its equivalent, is an essential qualification. For students who have been engaged in industry, and who have attended part-time day or evening classes, the scholarships are of the value of £100 per annum, while for students leaving secondary or central schools the value is £60. Both classes of scholarships are tenable for three years.

A special course of four lectures on television is being held at the Regent Street Polytechnic, London.

(See our classified advertisements.)

Reciprocating Engines for H.P. Steam

In our issue of June 19th, 1931, we gave the leading particulars of the two 3,750-kW triple-expansion vertical reciprocating engines of the Plant Carey Co., Ohio. Throttle steam conditions are 1,500 lb. per sq. in. and 800 deg. F. Exhaust is to evaporators for process work at 65 lb. per sq. in. Steam from the i.p. cylinders is reheated to 526 deg. F. in live-steam reheaters. These units, *Power* states, have been in commercial operation since December, 1931, and have proved that reciprocating engines can produce more by-product power from small quantities of steam than any turbine yet designed.

In the initial tuning-up great difficulty was experienced in the lubrication of the h.p. cylinders. This was surmounted mainly by the substitution of plug-type cylinders (with eleven piston rings) for disc-type, and the drilling of a multiplicity of oil holes in the h.p. cylinder walls. The piston rods were provided with wiper rings to prevent leakage from draining into the crank case, with an atmospheric vent between these rings and the stuffing boxes. Contamination of the exhaust steam by oil has been eliminated by a baffled separator, alum and caustic soda filters, and a skimmer tank (where oil is recovered for lubricating the l.p. cylinders) with a large trap. The use of a cast iron of greater hardness and more uniform structure has considerably reduced the wear on the cylinder liners, and also on the piston rings. The balance chamber between the h.p. and i.p. pistons which receives the leakage from both cylinders has been connected to the l.p. inlet instead of to the exhaust; by this means the piston-ring leakage has been reduced by one-third.

The Poplar Audit

At a meeting of the General Purposes Committee of the Poplar Borough Council held on April 20th, it was stated that the Special Joint Committee of the Electricity and Contracts Committees had reported on the result of its investigations relating to the extraordinary audit of the accounts of the Council (ELEC. REV., April 14th, p. 534), which is still proceeding, and it had adopted a resolution that Mr. J. H. Bowden, the borough electrical engineer and manager, be suspended from his office until the conclusion of the inquiries. The General Purposes Committee has approved the resolution, and has recommended that it be adopted and confirmed by the Council.

I.E.E. (North-Midland Centre)

A lecture on "A Model of the Electric Field" will be delivered by Sir J. J. Thomson, O.M., D.Sc., at the Great Hall of the University, Leeds, on May 9th at 5 p.m.

Appointments Vacant

Electrical engineering draughtsman for Air Ministry.

Mains assistant for Malvern Electricity Department.

Superintendent of mains and sub-stations for Swinton and Pendlebury Electricity Department.

Lecturer in electrical engineering for Chelmsford School of Art and Technology.

(See our classified advertisements.)

Makers' Names Wanted

LONDON-THAMESHAVEN portable handlamp.

Electric fishing ponds.

KENBAR iron.

Our Personal Column

Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements

Mr. M. G. Say, Ph.D., M.Sc., A.M.I.E.E., has been appointed by the Governors of the Heriot-Watt College, Edinburgh, to the Professorship of Electrical Engineering, in succession to Prof. Baily, who is retiring at the end of the current session. Dr. Say is at present lecturer in the department of Electrical Engineering at the Royal Technical College, Glasgow. He was educated in London and has had a distinguished academic career. In 1921 he took his B.Sc., with first-class honours in electrical engineering, at London University and was awarded a M.Sc. degree in the following year for a thesis on "The Theory and Design of Single-Phase Commutator Motors," and other papers. He was a student bursar of the Department of Scientific and Industrial Research, and in 1924 he was awarded the Ph.D. degree of London University for a thesis on railway electrification. Although only thirty-one years of age, Dr. Say has published a number of works on electrical engineering, as well as a translation of Lagron's "Induction Motors." In addition he has written numerous papers on the subject.

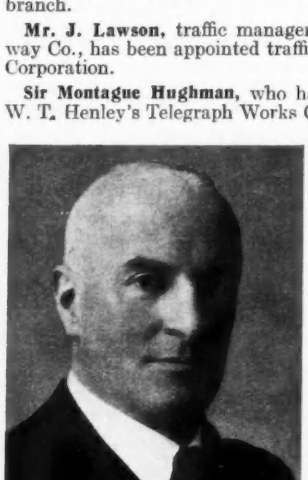
Mr. R. H. Paterson.—A committee of the whole Borough Council of Hammersmith has approved a recommendation of the General Purposes Committee that "Mr. Robert Howie Paterson, borough electrical engineer and manager (age sixty-one years), who has become incapable of discharging the duties of his employment by reason of permanent ill-health or infirmity of mind or body, be granted a lump sum of £1,514 13s. 10d., and an annual allowance of £491 15s. 8d., with effect on and from March 23rd, 1933, subject to the payment by him to the Superannuation Fund of contributions in respect of a sum of £168 15s. 4d., which was paid to him by way of additional salary, in accordance with a resolution passed by the Council on October 23rd, 1929."

Mr. Murdo Mathieson, an employé of the Grampian Electricity Co., who saved the life of one of his fellow workers at the time of the triple drowning tragedy in Loch Ericht in December last, has been presented with the bronze medal of the Royal Humane Society. The presentation was made recently by the Duchess of Atholl, M.P.

Mr. H. J. Norton, of Cardiff, has joined the English Electric Co., Ltd., as a sales engineer at the company's South Wales branch.

Mr. J. Lawson, traffic manager of the South Lancs Tramway Co., has been appointed traffic manager to the Rotherham Corporation.

Sir Montague Hughman, who has been elected chairman of W. T. Henley's Telegraph Works Co., Ltd., has been a director of Henley's since 1924, and has been actively interested in the commercial and technical work of the company. He entered the service of the late Mr. Robert Hammond in 1895, and was with him until 1907, when he joined the staff of the County of London Electric Supply Co. and worked under Sir Harry Renwick, remaining there until 1910, when he went to the East where he was engaged on his own account in engineering work, mainly electrical and shipbuilding. He was one of the founders and the hon. organising secretary of the Institution of Engineers (India), and was a member of council in 1920-1922. He was also hon. secretary to the Indian Section of the British Institution of Electrical Engineers from 1912 to 1921, when he retired from India. He has travelled extensively studying British, foreign, and colonial administration and the development of Empire trade, and is very well known to engineers in different parts of the world. Sir Montague is a son of the late Capt. Newman Reeve Hughman, and was educated at St. Mark's College, Upper School, Chelsea. He was knighted in 1922.



Sir Montague Hughman

Mr. A. A. Jackson, deputy transport manager and engineer to the Coventry Corporation, has been appointed manager and engineer to the St. Helens (Lancs) transport undertaking.

Mr. J. H. Gyles, A.M.I.E.E., M.(S.A.)I.E.E., who has held the position of assistant borough electrical engineer at Durban since the retirement of Mr. E. Poole in June last, has been appointed acting borough electrical engineer. According to the *South African Electrical Review and Engineer*, at a meeting of the Town Council on March 9th it was decided to defer the question of the appointment of a borough electrical engineer for a period of not less than three months, at the expiry of which the appointment will be re-advertised. Mr. Gyles has been in the Durban Electricity Department for thirty-three years.

Mr. C. A. Baker is retiring from the post of divisional engineer and senior electrical inspector of the London County Council to-morrow (April 29th). He has completed twenty-six and a half years' service, and during that period his official duties have brought him into personal touch with all the electricity supply authorities in and around London, while he has made many friends also in the general electrical world.

Mr. C. A. Baker

Included among the more important works which Mr. Baker has carried out are the electrical equipment of the County Hall, the lighting of the Victoria Embankment, the conversion of the Abbey Mills sewage pumping station from steam to electric driving; also the lighting arrangements for numerous housing estates, schools, fire stations, and other buildings. He was elected a student of the Society of Telegraph Engineers in 1886, and became a member of the Institution of Electrical Engineers in 1898. He was one of the English delegates at the International Electro-technical Congress held in Italy five years ago.

On April 6th Mr. Baker was entertained to dinner at the Holborn Restaurant by over 200 of his colleagues, and was presented with a microscope. The chief engineer of the L.C.C.—Mr. T. Pierson Frank—presided. In responding to a toast, Mr. Baker referred to the excellent relationship that existed between the different departments of the Council, and with the Post Office, the supply authorities, and the general public, for whom, as consumers, he had always done his best.

Additions have recently been made to the board of Messrs. L. Weekes (Luton), Ltd. Previous to March 31st the directors were Mr. T. H. Dryden (governing) and Mr. R. Martin. The new elections are: **Messrs. C. H. Dryden, A. Wilkinson,** and **H. V. Smith,** the last named being also the secretary of the company.

Mr. G. Shearing, B.Sc., has been nominated chairman of the Wireless Section of the Institution of Electrical Engineers for the session 1933-34, and **Mr. G. W. N. Cobbold,** M.A., has been nominated vice-chairman.

Mr. Edward Kennedy, foreman electrician at the Frodingham Iron and Steel Works, has been elected chairman of the Scunthorpe Urban District Council.

Mr. J. H. Sandiford, A.M.I.E.E., has been appointed assistant London manager of the Simplex Electric Co., Ltd., at Creda House, 219, Tottenham Court Road, W.1.

Mr. W. I. Tarleton, distribution engineer in the Capetown Electricity Department, has retired after thirty-seven years' service, and has been presented by the employés and heads of departments with a silver tea service and a clock. The presentation was made by Mr. Swingler, the city electrical engineer.

Mr. S. Gordon Monk, head of the Electrical Department of the Plymouth and Devonport Technical College, has been elected as the new president of the Plymouth Institution, the city's premier scientific and educational body, which has now been in existence for 121 years.

Mr. Rollo Appleyard has written a biography of the late Sir Charles Parsons, which will be published on May 11th by Constable under the title "Charles Parsons—His Life and Work."

Miss Eva Moss, who has been hon. secretary of the Bradford branch of the Electrical Association for Women since its inception three years ago, was married at Bradford, on April 20th, to Mr. A. W. Burgoyne, a member of the staff of Salts (Saltaire), Ltd. The bride was given away by her father, Mr. Harry Moss, who is chairman of the Bradford branch of the Electrical Contractors' Association.

Professor Elihu Thomson celebrated his eightieth birthday on March 29th, and the occasion was marked by a scientific conference, a historical exhibit, and a testimonial dinner at the Massachusetts Institute of Technology. The conference was attended by 250 guests, members of the instructing staff, and graduate students. At the dinner in the evening telegrams of congratulation were received from President Roosevelt and

ex-President Hoover. Speakers during the evening included Messrs. J. B. Ely, Governor of Massachusetts, G. B. Cortelyon, president of the Consolidated Gas Co., of New York, H. P. Charlesworth, president of the American Institute of Electrical Engineers, and Dr. Compton. Plans were announced for the establishment of an Elihu Thomson professorship in electrical engineering to be effective as soon as funds were available.

Mr. B. L. Kent, of the Newport staff of the Isle of Wight Electric Light & Power Co., Ltd., was married at St. Paul's Church, Barton, on April 12th, to Miss P. J. Simmonds, of Newport.

Mr. H. G. Alsop, manager at Bradford-on-Avon for the West Wilts Electricity Co., Ltd., who was recently married to Miss M. R. Salway, has been presented by the directors with a canteen of cutlery, and by his colleagues with an engraved oak biscuit barrel.

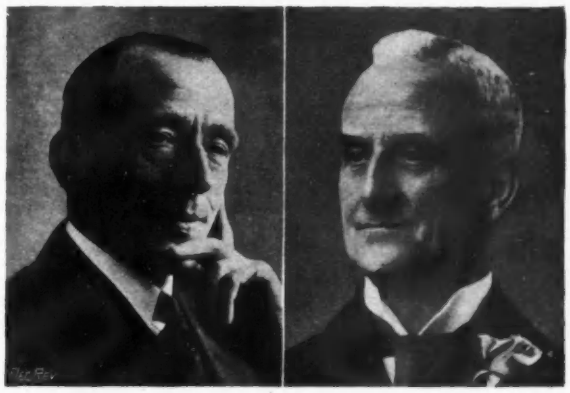
Mr. A. L. Wallwork, assistant mains engineer in Blackburn Corporation Electricity Department, was married on April 19th to Miss Norah Gosling. The wedding presents included a mahogany chiming clock from the staff and employés of the Electricity Department.

Mr. B. Welbourn was elected chairman for the 1933-34 session at the recent annual general meeting of the Mersey and North Wales (Liverpool) Centre of the Institution of Electrical Engineers. Mr. R. G. Devey and Mr. O. C. Waygood were elected vice-chairmen, Mr. L. Breach hon. treasurer, Mr. O .C. Waygood hon. secretary, and Mr. W. Parry hon. assistant secretary.

Mr. James R. Laird has been elected president of the West of Scotland branch of the Association of Mining Electrical Engineers. Mr. Laird is a native of Armadale, and began his career as an apprentice with the Pumpherston Oil Co., later joining the British Westinghouse Co. when that company commenced business in Manchester. He was also chief electrical and mechanical engineer of the Oakbank Oil Co., and later chief electrical engineer of the United Collieries, Ltd., Eastern District. At present Mr. Laird holds the position of superintending electrical engineer with Carron Company, Falkirk.

Consequent upon the formation of the new Joint Transport Board of Burnley, Nelson and Colne, of which **Mr. Charles H. Stafford** has been appointed general manager, the *Electric Railway, Bus & Tram Journal* reports that the following appointments have been made: **Mr. R. Whalley,** traffic superintendent to Nelson Corporation Transport Department, to be area traffic superintendent for the new Board; **Mr. H. Broughton,** chief clerk of the Burnley Corporation Tramways and Omnibuses, to be chief administrative assistant to the joint undertaking; and **Mr. A. Blacow,** chief assistant and rolling stock superintendent of Colne Corporation Transport Department, to be assistant engineer in charge of the bus department of the combined undertaking.

Mr. P. V. Hunter, C.B.E., M.I.E.E., joint manager and chief engineer of Messrs. Callender's Cable & Construction



[*Elliott & Fry*

Mr. P. V. Hunter and Mr. C. Pipkin

Co., Ltd., and **Mr. C. Pipkin,** joint manager, have been appointed advisory directors of the company, the appointments dating from January 1st last.

Mr. P. Coursey, technical director of the Dubilier Condenser Co. (1925), Ltd., was to sail for the United States on Wednesday last. During his visit he is to investigate the American market for resistors and condensers.

Obituary

Mr. E. Cross.—Mr. Edward Cross, electrical engineer to the Rotherham Corporation, died in a Rotherham nursing home on April 17th. Mr. Cross, who was fifty-nine, was a native of Whitehaven, where he obtained his first electrical experience. In 1891 he joined the National Electrical Supply Co., Preston, and from 1894 to 1898 had full charge at Bradford under the city engineer. In the latter year he proceeded to Aberdeen as chief assistant to the city engineer, and remained there until 1901, when he went to Rotherham as the first borough electrical engineer. From 1905 until towards the end of the war he held the dual appointment of electrical engineer and tramways manager to the Rotherham Corporation, and, upon the separation of the managerships, concentrated upon the development of the electricity undertaking. He was largely responsible for the extensions at the original works, and for the erection of the super power station, which was formally inaugurated by the Prince of Wales in 1923, and which became a selected station under the Central Electricity Board's scheme. The new station maintained one of the lowest generating costs in the country, and in 1929 an inter-linking arrangement with Sheffield was put into operation, under which Rotherham agreed to supply Sheffield with electricity in bulk for five years. Mr. Cross became an associate member of the Institution of Electrical Engineers in 1905, and a full member in 1925. He was also a member of the Institution of Mechanical Engineers.

[*Lafayette*

The late Mr. Edward Cross

Mr. J. Telfer.—The death occurred recently, at Frizinghall, Bradford, of Mr. John Telfer, general manager of the Warrington Corporation Tramways Department. He was a native of Bradford, and his first post was with the Bradford Tramways Department over thirty years ago. Subsequently he became assistant manager of the Rotherham tramways, and was then appointed to the managership at Warrington. Many representatives of Warrington Corporation and municipal services attended the funeral at Bradford on April 21st, and there were also representatives of the Lancashire United Transport & Power Co., Ltd., the Bradford Corporation Tramways, the Leeds City Tramways and Transport Department, the Blackburn Corporation Tramways, the Burnley Tramways, the council of the Lancashire and Cheshire Tramways Association, and the Stalybridge, Hyde, Mossley, and Dukinfield Tramways and Electricity Board.

Mr. J. B. Lowdon.—Mr. J. B. Lowdon, one of the pioneers of electrical engineering in Scotland, and founder of Lowdon Bros. & Co., Ltd., died at his residence in Dundee on April 23rd, at the age of seventy-three years. A native of Dundee, he was educated at the High School, and began his career as a pupil to the engineer in charge of the building of the first Tay Bridge. Early in his career he formed the first telephone company in the city, and acted as manager for several years. He was the first man to demonstrate the electric dynamo and electric lighting in Dundee. Subsequently, as an electrical engineer, he carried out many large contracts all over the British Isles. He acted as consulting engineer to a large group of laundries and many hydros. He was also a pioneer of tramway undertakings, and carried out installations in Blackpool, Lancaster, Portsmouth, and other English cities. He became chairman of the Electrical Contractors' Association of Scotland in 1914. The interment took place on Wednesday last at Balgay Cemetery, Dundee.

Sir Henry Royce, Bt.—Sir Henry Royce, Bt., the designer of motor cars and aero-engines, died on April 22nd at his home at West Wittering, near Chichester, at the age of seventy. Born in 1863, he commenced an apprenticeship at the Great Northern Railway works at the age of fourteen, but owing to lack of money had to abandon his apprenticeship. After a short period at a gun factory he obtained an appointment with an electric lighting company as a tester, and studied at the City and Guilds College. In 1882 he was appointed chief electrical engineer for the pioneer lighting of the streets of Liverpool, and upon reaching his majority commenced business on his own account and founded the firm of Royce, Ltd., mechanical and electrical engineers, which specialised in electrical dynamos and cranes. The automobile business of Royce, Ltd., was combined with that of C. S. Rolls & Co., as Rolls-Royce, Ltd., in 1907, and Sir Henry became works director and chief engineer. He designed engines which gained for Great Britain the world speed records on land, sea, and in the air. He received the O.B.E. in 1918 and was created a baronet in 1930.

[*Press Portrait Bureau*

The late Sir Henry Royce

Financial Section

New Companies, Returns of Share Capital, Debenture Charges, Reports of Electrical Companies, Dividend Changes, Transactions in Stocks and Shares

New Companies Registered

Midland Electric Radio, Ltd.—Private company. Registered April 21st. Capital, £2,000 in £1 shares (500 5 per cent. cumulative preference and 1,500 ordinary). Objects: To acquire the business of wireless and general electrical engineers and suppliers of and dealers in wireless sets, electrical equipment, &c., now carried on at 84, High Street, Stourbridge, and to adopt an agreement with S. C. Whitehouse and J. Whitehouse. The directors are: J. Whitehouse (chairman), 88, Wellington Road, Dudley; and S. C. Whitehouse, Brynawel, Lyttelton Road, Hagley, Worcs. Solicitor: Alfred E. Thomas, 198, Wolverhampton Street, Dudley.

Waterford Electrical and Chemical Works, Ltd.—Private company. Registered in Dublin on March 27th. Capital, £2,500 in £1 shares. Objects: To carry on the business of manufacturers of, dealers in, and agents for machinery, goods, apparatus and appliances for the production of electricity, &c. The subscribers are: P. Purcell, 13, Parnell Street, Waterford; M. Kennedy, 4, The Mall, Waterford; and P. Flynn, 55, High Street, Waterford.

Lewis & Hall (Electrical), Ltd.—Private company. Registered April 21st. Capital, £1,000 in £1 shares. Objects: To acquire the business of an electrical and mechanical engineer now carried on by Geo. A. Lewis at High Street, King's Heath, Birmingham, as "Lewis & Hall." The permanent directors are: G. A. Lewis (chairman) and Mrs. E. E. Lewis, both of 144, Woodthorpe Road, King's Heath, Birmingham.

Radialaddin (Branches), Ltd.—Private company. Registered April 22nd. Capital, £1,000 in 950 10 per cent. cumulative preference shares of £1, and 1,000 ordinary shares of 1s. each. Objects: To carry on the business of manufacturers of, agents for and dealers in radio sets, gramophones, cinematograph producers, &c. The directors are: E. Godal, 4, Hyde Park Place, W.2, and Miss H. M. Donne, 113, Haverstock Hill, N.W.3. Registered office: 46, Brewer Street, W.1.

Jimmy Wilde & Fred Price, Ltd.—Private company. Registered April 8th. Capital £500 in £1 shares. Objects: To carry on the business of an electric light company in all its branches. The directors are: W. J. Wilde and D. J. Wilde, both of "Lonsdale," Hampstead Heath, N.W. Secretary: J. Studley. Registered office: 6, Charles Street, Cardiff.

Swift Products, Ltd.—Private company. Registered April 22nd. Capital £500 in £1 shares. Objects: To carry on the business of manufacturers of chemical compounds for the revival and charging of accumulators and batteries, &c. The permanent directors are: O. P. Swift, 9a, Randolph Road, Maida Vale, W.9, and M. Mazower, 20, Oakshott Avenue, Highgate, N.6. Registered office: 228, Bishopsgate, E.C.2.

Langfelder Putzker & Goodman, Ltd.—Private company. Registered April 20th. Capital, £200 in £1 shares. Objects: To carry on the business of manufacturers of, agents for and dealers in electric bulb caps and holders and electrical and gas plant, machinery fittings, equipment and accessories, &c., and to adopt an agreement with George Goodman, Ltd. The subscribers are: B. L. Goodman and G. B. Goodman, both of 42, Westfield Road, Edgbaston, Birmingham. Registered office: 82, Caroline Street, Birmingham.

"362" Radio Valve Co., Ltd.—Private company. Registered April 20th. Capital, £250 in 1s. shares. Objects: To carry on the business of manufacturers of wireless valves, electric lamps, and X-ray and other electrical tubes, wireless apparatus and equipment, &c. The directors are: C. Croydon-Fowler, 71, Upper Street, Islington, N.1; and Dr. S. Turtle, 34, Pembury Road, E.5. Registered office: 415, Mare Street, E.

Refrigerator Builders, Ltd.—Private company. Registered April 22nd. Capital, £200 in £1 shares. Objects: To carry on the business of manufacturers, importers, exporters and shippers of, and agents and merchants for, the sale of refrigerators, &c.; electricians, electrical and mechanical engineers, &c. The directors are: W. Kay, 21, Bolton Street, Bury, and C. Wood, 5, Mellor Street, Prestwich. Solicitor: C. E. Halliwell, 21, Bolton Street, Bury.

Burne, Morrison & Co., Ltd.—Private company. Registered April 8th. Capital, £100 in £1 shares. Objects: To carry on business as electrical and mechanical engineers, manufacturers of and dealers in dynamos, motors, armatures, batteries, &c. The directors are: W. G. Burne, 18, Denmark Avenue, S.W.19, and R. L. Morrison, 221, Broomwood Road, Clapham Common, S.W.11. Registered office: 221, Broomwood Road, Clapham Common, S.W.11.

Latimer Engineering Co., Ltd.—Private company. Registered April 6th. Capital, £450 in £1 shares. Objects: To carry on the business of mechanical and electrical engineers, &c. The directors are: R. P. Swann, 44, Prebend Street, Bedford; and T. J. Dawes, 39, Priory Gardens, Hanger Lane, Ealing, W.5. Secretary: R. P. Swann.

W. M. Williamson (Petts Wood), Ltd.—Private company. Registered April 6th. Capital, £300 in £1 shares. Objects: To carry on the business of electrical, wireless, mechanical and general engineers, engineering contractors, &c. The directors are: F. M. Williamson, 34, Woodwards Road, S.E.22; and two others.

Pollson, Ltd.—Private company. Registered April 7th. Capital, £500 in £1 shares. Objects: To carry on the business of dealers in electric lighting, power and ignition apparatus, and accessories, electrical and reproduction apparatus, &c. The subscribers are: J. Gibson and D. A. Pollock, both of 2, Northwold Buildings, N.16.

Returns of Electrical Companies

General Electric Co., Ltd.—Particulars have been filed of debenture stock to secure £3,500,000 and any further stock issued under the trust deed, not exceeding in all £4,000,000, together with a premium (in certain events) of 5 per cent., authorised February 27th, 1933, and covered by a trust deed dated March 28th, 1933. The amount of the present issue is £3,500,000. Property charged: Certain freehold property at Aston-juxta-Birmingham, Salford, Stoke, Warwickshire, Erith, Hammersmith, Wembley and Birmingham, leasehold properties at Magnet House and Clare House, Kingsway, W.C.2, and the company's undertaking and other property, present and future, including uncalled capital. Trustees: The Midland Bank Executor & Trustee Co., Ltd. (The stock was issued at an underwriting commission of 1½ per cent. on the nominal amount, and a fee of 5,000 guineas was paid, out of which the underwriters defrayed the whole of the expenses incidental to the creation and issue of the stock.)

Julius Sax & Co., Ltd.—Capital, £10,000 in 3,000 7½ per cent. preference shares of £1 and 35,000 ordinary shares of 4s. each. Return dated December 23rd, 1932. 2,650 preference and 18,000 ordinary shares taken up. £5,051 paid on 2,650 preference and 12,005 ordinary shares. £1,199 considered as paid on 5,995 ordinary shares. Mortgages and charges, nil.

Barker Young & Co., Ltd.—Satisfaction on February 16th, 1933, of mortgage dated June 23rd, 1932, and registered June 29th, 1932. (According to the register of mortgages, the mortgage registered June 29th, 1932, originally secured £468 and any other moneys due or to become due.)

L.E.S. Distributors, Ltd.—Capital, £5,000 in 1,000 ordinary and 4,000 preference shares of £1. Return dated November 25th, 1932 (filed January 17th, 1933). 750 ordinary and 3,750 preference shares taken up. £3,750 paid. £750 considered as paid. Mortgages and charges, nil.

Barbados Electric Supply Corporation, Ltd.—Capital, £100,000 in £1 shares (increased from £60,000 on February 13th, 1933). Return dated December 26th, 1932. 60,000 shares taken up. £38,051 paid on 38,051 shares. £21,949 considered as paid on 21,949 shares. Mortgages and charges, £15,000. A further 20,000 shares were allotted as fully paid by way of capitalisation of profits on February 13th, 1933.

Keighley Electrical Engineering Co., Ltd.—Capital, £10,000 in 3,000 preference and 7,000 ordinary shares of £1 each. Return dated December 22nd, 1932. 2,300 preference and 4,201 ordinary shares taken up. £4,489 paid on 1,900 preference and 2,589 ordinary shares. £2,012 considered as paid on 400 preference and 1,612 ordinary shares. Mortgages and charges, £3,668 12s. 5d. (at December 22nd, 1932).

Lunar Electrical Co., Ltd.—Debenture dated April 10th to secure £3,700 and all moneys which the holder may be called upon to pay under certain guarantees not exceeding £2,000. Property charged: The company's undertaking and property, present and future, including uncalled capital. Holder: W. R. Preston, 3/7, New Street Square, Fetter Lane, E.C.

Burma Electric Supply Co., Ltd.—Capital, £270,000 in 150,000 preference and 120,000 ordinary shares of £1 each. Return dated December 21st, 1932. 120,000 preference and 120,000 ordinary shares taken up. £100,000 paid on 100,000 preference shares. £140,000 considered as paid on 20,000 preference and 120,000 ordinary shares. Mortgages and charges, nil.

Llangollen & District Electric Light & Power Co., Ltd.—Satisfaction in full on April 4th of two debentures for £500 each, and mortgage, collateral thereto, all dated December 4th, 1924, and registered December 15th, 1924.

Electrical and Engineering Products, Ltd.—The nominal capital has been increased by the addition of £2,500 in £1 ordinary shares beyond the registered capital of £500.

R. E. Stichling, Ltd.—Capital, £1,000 in £1 shares. Return dated January 13th, 1933. All shares taken up. £2 paid. £998 considered as paid. Mortgages and charges, £1,000.

Flinders (Wholesale), Ltd.—Issue on March 13th of £2,830 second mortgage debenture stock, part of a series already registered.

R. A. Poole (London), Ltd.—Capital, £1,000 in £1 shares. Return dated December 31st, 1932. All shares taken up. £10 paid. £990 considered as paid. Mortgages and charges, nil.

City Notes

Babcock & Wilcox, Ltd., report a net profit for the year ended December 31st last of £219,244, as compared with £569,620 in the preceding year. From this is deducted £18,432 contributed to the staff pension fund, and after adding £32,671 brought in and £125,000 transferred from dividend equalisation fund, there is a total of £358,483 available. It is proposed to pay a final ordinary dividend of 3 per cent. and to distribute 1½ per cent. actual out of the profit on the sale of investments, making the total ordinary distribution for the year 9 per cent. (against 14 per cent.), and to carry forward £21,056. The report states that the year under review has been the most difficult in the history of the company, and only by carrying on a policy of strictest economy has it been possible to achieve the results shown. The value of the company's investments in Government securities, shares in other companies, and shares in associated and subsidiary companies is in excess of the figure at which it stands in the balance sheet. The returns received from the associated and subsidiary companies are, in the aggregate, satisfactory. Meeting: May 3rd.

The East Anglian Electricity Supply Co., Ltd., held its annual meeting on April 19th, when Mr. A. Winterbottom (chairman),

who presided, said that during the past year general progress had been made. The non-statutory undertaking in Thetford was purchased during the year, and Halesworth was changed over from d.c. to a.c. and now received a supply in bulk from the Yarmouth Corporation. New district offices and showrooms had been opened in Fakenham and Downham Market. During the year eighty-six miles of e.h.p. lines were put into operation, making a total of 242 miles, and l.p. lines were increased by sixty-six miles to 186 miles. Additional towns and villages supplied during the year numbered forty-seven, bringing the total up to ninety-five. The number of consumers increased by 4,095 to 10,590; and the sales of electricity by 1,157,231 to 3,321,199 kWh. The board had provisionally approved a programme of development for 1933 estimated to cost £200,000, and of this sum sanction had been given to an expenditure of approximately £170,000.

The Calcutta Electric Supply Corporation, Ltd., announces a profit for 1932, after providing for depreciation, of £440,988, as compared with £431,770 in the preceding year; to this is added £39,674 brought in, making £480,662. After deducting debenture interest, &c., placing £60,000 to reserve for taxes, and £50,000 to general reserve, it is proposed to pay a final dividend on the ordinary shares of 7 per cent., making 12 per cent. for the year, less tax (same), together with a bonus of 2d. per share, less tax (against 3d. per share), and to carry forward £35,166. It is proposed to grant to the staff in India a bonus equivalent to 2 per cent. of the Indian net profit in respect of approved service actually rendered in 1932. The sales of electricity increased from 177,752,613 kWh to 185,134,324 kWh. The report states that the continued depression prevented any recovery in the industrial load. The domestic demand, however, showed a moderate improvement, though the reduction in the flat rate in the middle of 1931 has affected the revenue. Meeting: May 8th.

Johnson & Phillips, Ltd., report a profit for the year ended December 31st last of £56,455, as compared with £96,455 for the preceding year, and after deducting debenture interest, depreciation, &c., there is a net profit of £21,341 (against £35,494). To this is added £102,717 brought in, and after placing £5,000 to research and development account, and transferring £10,000 from dividend equalisation account, a total of £129,058 is available. It is proposed to pay a dividend of 5 per cent., less tax, on the ordinary shares (same), and to carry forward £99,058. The report states that owing to the policy of restricted expenditure pursued by many users of cables and electrical plant, the company experienced a considerable reduction in business during the year under review. Meeting: May 4th.

The Anglo-American Telegraph Co., Ltd., in its report for the year ended March 31st last, states that three quarterly interim dividends of 15s. per cent. on the ordinary stock and £1 10s. per cent. on the preferred ordinary stock have been paid, and on February 1st the final dividend for the year ended December 31st was paid amounting to £1 10s. per cent. on each of the ordinary, preferred ordinary, and deferred ordinary stock. These payments, together with £65,625 for income tax, absorbed £262,500, being the rent paid by the Western Union Telegraph Co. for the year. The balance at credit of revenue account (£65,625) is available for the payment of dividends and income tax for the quarter to March 31st. Meeting: May 9th.

The Madras Electric Tramways (1904), Ltd., held its annual meeting on April 24th. Mr. J. G. B. Stone (chairman), who presided, in the course of his speech said that there were increases of 4.2 per cent. in traffic receipts and 4.9 per cent. in the number of passengers carried over 1931. The double tracking of the system was being pushed on, and the conversion of the cross-bench cars to the corridor type was also proceeding. Four complete new double-bogie cars had been put into service, and when the conversion scheme had been completed they would have a fleet of 100 modern cars of large capacity. Motor-bus competition still prevailed, but the tramways had held their own.

The Calcutta Tramways Co. reports a revenue for 1932 of £95,764, as compared with £75,707 in the preceding year. It is proposed to pay a final ordinary dividend of 3½ per cent., less tax, making 6 per cent. for the year, leaving £9,149 to go forward, against £6,179 brought in. The outstanding 7 per cent. second registered debentures will be redeemed on May 15th next. To replace these £250,000 5 per cent. second debenture stock was placed in January last. The directors state that despite the continuance of adverse conditions, receipts showed an increase of 6.61 per cent., and the passengers carried an increase of 7.17 per cent. The improvement continues.

The Hydro-Electric Securities Corporation reports a total income for 1932 of $1,066,386, as compared with $3,021,959 in the preceding year. One dividend of 10 cents a share was paid during the year on the common stock (against a total of $1 per share), and the earned surplus to go forward is increased by $277,643 to $1,764,060. A large proportion of the investments are in public utility companies in the United States, and these showed a severe falling off in earnings in 1932, with the result that there has been a further shrinkage in the value of the company's investments. The value of the investments on December 31st was $15,005,830, showing a depreciation of $38,055,934 compared with original cost. This depreciation is provided for to the extent of $35,583,769 by the appropriation made in 1931 from common stock account and by reserves. The remainder ($2,472,165) is not provided for.

Stewarts & Lloyds, Ltd., report a profit for 1932 of £272,023, as against £317,272 in the preceding year, from which £152,030 is set aside for depreciation, leaving £119,993. It is proposed to pay the final dividends on the preference shares and to carry forward £156,738.

The Oriental Telephone & Electric Co. has announced a final ordinary dividend of 8 per cent., making 12 per cent. for the year (against 12 per cent., plus a special bonus of 2 per cent.).

The Sun Electrical Co., Ltd., has decided to defer payment of an interim ordinary dividend until the final accounts for the year to April 30th are before the board.

The Nederlandsche Kabelfabriek reports net profits of 1,030,000 fl for 1932 as compared with 1,322,000 fl in the previous year, and the dividend is 15 per cent. as against 17 per cent. The report states that a very considerable amount from interest on the investments contributed towards the profits. Despite the difficulties in the export trade, it was found possible to discover new markets for the company's products.

The Electric Supply Corporation, Ltd., reports a gross revenue for 1932 of £113,990 (against £88,380 in 1931), and net revenue of £57,920 (£53,562). It is proposed to place £6,000 to the repairs, renewals and depreciation fund, and to pay a final ordinary dividend of 7 per cent., making 11 per cent. for the year, leaving £23,354 to be carried forward.

Pye Radio, Ltd., reports a net profit for 1932 of £118,871, as compared with £122,676 in 1931, to which is added £63,036 brought in, making £181,907. It is proposed to pay a final dividend of 117 per cent. on the deferred ordinary shares, making 125 per cent. for the year (same), and to carry forward £91,902.

Laurence, Scott & Electromotors, Ltd., report a loss on trading for 1932 of £18,648. A sum of £11,119 is placed to depreciation, and £28,997 is transferred from reserve. The loss in the preceding year was £41,259, which was met from reserves. Meeting: Norwich, April 25th.

The British Electric Transformer Co., Ltd., reports a loss for 1932 of £10,266, against a loss of £89,512 for 1931. Since the amalgamation with Messrs. Crompton, Parkinson, Ltd., became effective, economies have been made in manufacturing costs, overhead charges, and administration generally.

Hopkinsons, Ltd.—The directors do not propose to declare a final ordinary dividend. An interim distribution of 2½ per cent. has already been made, and the total dividend for 1931 was 5 per cent.

The Canadian Westinghouse Co. reports a net profit for 1932 of $706,330, as against $1,842,740 in 1931. Dividends of $2 per share are paid (against $3 per share).

The British Power & Light Corporation (1929), Ltd., has announced a dividend for the year ended March 31st of 3 per cent. on the ordinary shares.

The Sheerness & District Electric Supply Co. reports a net revenue of £23,541 for 1932. A dividend of 10 per cent. is paid (same), and £7,526 is carried forward.

The Lewes & District Electric Supply Co. earned a net revenue of £15,033 last year. The reserve receives £4,000, and the dividend is maintained at 10 per cent., £3,652 being carried forward.

The Birkdale District Electric Supply Co. reports a net revenue for 1932 of £12,444 (against £11,751 for 1931). The dividend is maintained at 6 per cent. and £5,338 is carried forward.

The Shawinigan Water & Power Co. has declared a dividend for the quarter ended March 31st of 12 cents per share.

The North Wales Power Co. is paying a dividend of 3½ per cent. on the ordinary shares for 1932 (against 4 per cent.).

Murex, Ltd., has announced an interim ordinary dividend of 10 per cent. (against 15 per cent.).

Stocks and Shares

TUESDAY EVENING.

STOCK EXCHANGE markets are in a slightly uncertain frame of mind, induced by the doubts raised in consequence of the official departure of the United States from the gold standard. That the step was not entirely unexpected in what Jeames calls "the best circles" seems now to be obvious from the manner in which the Bank of England had been a consistent buyer of gold for some weeks past. To the man in the street, however, President Roosevelt's abrupt action was a matter for some surprise. The immediate effect was a heavy fall in gold-mining shares, followed, illogically enough, by a drop in the price of gilt-edged securities. American utility and railroad issues took an upward turn; some prices spurted strongly. The situation in mining shares and gilt-edged stocks swung round in the opposite direction upon investor and speculator coming in to take advantage of the falls. The Budget aroused very little interest in advance of its "opening."

Home and Foreign Railways

Rises of a point apiece in Districts, London Electric, Central London assented ordinary, and Metropolitan consolidated stocks are the chief changes in the group of Undergrounds. The market in Home Railways is marking time, speculation being occupied with other matters, while investment is shy of taking a hand, except in very modest fashion. The probable quotations for stocks of the London Passenger Transport Board mentioned here on recent occasions have served to attract interest to London United Tramway 4 per cent. debenture, which has risen 2 points, and to the preference shares of the London & Suburban Traction Company, which at 16s. are 1s. higher. If the suggested prices for the London Passenger Transport issues should prove to be those at which the market in the stocks will open, the equivalent securities in the railway and tramway companies have been looking under-valued, and this is the reason for the improvement in the prices.

Amongst foreign stocks, Brazilian Tractions rose a point to 11, in company with the general run of American prices after the departure of the United States from the gold standard.

Gilt-edged Stocks and Shares

Prices of the gilt-edged stocks connected with electrical enterprise are unaffected by the existing state of affairs. The 4½ per cent. debenture stocks of the London & Home Counties J.E.A. and the Central Electricity Board remain at 108. The ordinary shares of the London electricity supply companies, which it is fair to regard as being gilt-edged in their particular class, show no changes. The apprehension that

lurks at the back of the investor's mind is that there might be a falling off in the demand for gold as the result of the increased prices for commodities and a general advance in costs. Economists in various Governments are apparently convinced that one panacea which will remedy, if it does not entirely cure, the ills of the world is an all-round advance in the prices of commodities, base metals, &c. This is another way of saying that the price of gold stands too high, but to enter into an argument on the subject would have the result of filling columns of this paper, and arriving at no definite conclusion at the finish.

Electricity Supply Shares

The timidity is not extended to the shares in the London electricity supply companies, nor, in point of fact, is it likely to do so, so tenaciously are the shares held by the best class of investor. Some of the Provincial companies' shares are a little better. Bournemouth & Poole have strengthened to 73s. 9d. ex dividend, Northamptons to 51s. 3d., both showing rises of 1/6, while Yorkshire Electrics at 43s. 3d. are 9d. higher.

Electric Supply Corporation shares are unchanged at 66s. 3d. on announcement of a final ordinary dividend of 7 per cent., making 11 per cent. for the year. The net revenue balance to the Corporation for 1932 shows an improvement of £4,400. The North Somerset Electric Company's profit for 1932 of £34,000 is £3,800 up, and the previously paid dividend of 7 per cent. on the ordinary shares is repeated. The price is 34s. 6d., and the company's 5½ per cent. preference shares stand at 24s. 6d.

North Metropolitans went ex rights to-day, Tuesday. They are now 56s. 6d., the new shares being quoted at 17s. premium.

Cables and Wireless

The Cables & Wireless traffic return of Imperial & International Communications will be published on the Thursday in this week, being a few days later than usual owing to the incidence of the Easter holidays. The 5½ per cent. preference stock has fallen 2 points to 81½. The "A" ordinary stock is 1 down at 27, and the "B" ordinary ¾ down at 10. Globe ordinary and preference are unchanged at 11 and 11¾ respectively. The excitement in American shares caused by President Roosevelt's announcement led to a rise of 4½ points in the shares of the International Telephone & Telegraph, which raised the price to 14. American Telephone & Telegraphs, which fell nearly 10 points last week to 127½, are another 5 points lower at 122½. These two movements reflect the contradictory currents that are noticeable in most of the stocks and shares connected with the United States.

Manufacturing and Equipment Shares

British Insulated ordinary are 1/6 lower at 68s. 9d. Henley's have similarly declined to 6 3/16. Falls of 9d. occurred in Ever-Ready shares to 28s., and in Crompton Parkinson 8 per cent. preference to 32s. The Ever-Ready dividend should be announced this week. Associated Electrical ordinary have recovered the dividend deduction, and at 15s. 9d. show no change. Babcock & Wilcox have resolved the curiosity felt in regard to their final dividend for 1932 by declaring 7½ per cent. dividend, plus 1½ per cent. bonus, the former less tax, the latter free. The dividend works out to practically 9½ per cent., making allowance for the tax-free bonus, and this compares with 14 per cent. in 1931-1932. The price of the shares, which had previously been flat upon fears that the dividend would be cut, has fallen still farther to 32s. 6d., the figures being regarded as disappointing. Vickers are 6s. ex dividend. English Electrics remain dull at 7s. 6d. for the ordinary, 11s. 3d. for the preference.

International Automatic Telephone ordinary and B shares are both ex dividend at 33s. 9d. Telephone Properties at 20s. are also ex.

Last Year's Dividends

Attention may be conveniently drawn to the alteration made in our list of prices, so far as the dividend dates are concerned. It is now possible to include in the tables the list of the dividends paid for 1932 by most of the companies whose shares are quoted. This applies to all those in the group of home electricity undertakings and home railways. It is not yet possible, however, to bring up to date the dividends for manufacturing and equipment shares. For instance, companies that have not yet declared their final dividends for 1932 include Callender's, General Electric, Henley's, and Siemens Bros. British Insulated Cables has repeated its previously paid 15 per cent., and Associated Electrical Industries 4 per cent. Until the full tale of the 1932 dividends is completed, the figures set out in the tables must continue to be calculated on the distributions for the previous year, 1931. The aim is, however, to bring the list completely up to date at the earliest possible moment. Where the dividend for 1932 differs from that of 1931, the yield per cent. given in the last column is worked out, of course, on the 1932 distribution.

The Stock Exchange

The Stock Exchange financial year ended on March 25th, and the accounts now published show that the Stock Exchange spent £4,760 upon electric power, working expenses, and maintenance. This compares with an expenditure on the same items last year of £4,491. In view of the quantity of power used, any expenditure under £5,000 would seem to be modest.

Share List of Electrical Companies

Home Electricity Companies.

	Nom.	Approx. Dividend. 1931.	1932.	Price, Apl. 25.	Rise or Fall.	Yield p.c. £ s. d.
Bournemouth and Poole	1	15	15	73/9xd.	+1/6	4 1 4
Brompton Ordinary	1	8½	7	33/-xd.	—	4 4 10
Central Electricity 4½% Deb.	Stock	4½	4½	108	—	4 3 4
Charing Cross Ordinary	1	8½	7	33/6	—	4 2 7
Chelsea	1	8½	7	32/6xd.	—	4 6 2
City of London	1	10	10	33/6	—	4 3 7
Clyde Valley	1	7	7	35/-	—	4 0 0
County of London	1	10½	10½	53/9	—	3 18 8
Edmundsons' 7% Pref.	1	7	7	30/6	—	4 11 10
Elec. Dis. Yorkshire	1	9	9	45/9	—	3 18 7
Elec. Supply Corporation	1	11	11	66/3	—	3 6 8
Kensington Ordinary	1	8	7	33/-	—	4 4 10
Lancs Light and Power	1	7	7	32/6	—	4 6 2
London & Home Counties 4½% Deb.	Stock	4½	4½	108	—	4 3 4
London Electric	1	9	7	32/6	—	4 6 2
Metropolitan	1	10	10	50/-	—	4 0 0
Midland Counties	1	7	7	35/-	—	4 0 0
Mid. Elec. Power	1	8	8	38/9	—	4 2 6
North Eastern Electric Ordinary	1	6	6	30/-	—	4 0 0
Do. 7% Pref.	1	7	7	33/-	—	4 4 10
Northampton	1	10	10	51/3	—	3 18 2
Notting Hill 6% Pref.	10	6	6	13½	—	4 10 7
North Met. Elec. 6% Pref.	1	6	6	30/-xd.	—	4 0 0
St. James' and Pall Mall	1	8	7	32/6	—	4 6 2
Scottish Power	1	8	8	36/3	—	4 8 2
South London	1	8½	7	33/-xd.	+6d.	4 4 10
Urban Ordinary	1	7	7	38/9	—	3 12 2
Westminster Ordinary	1	8½	7	32/6	—	4 6 2
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	17/6	—	8 11 2
Yorkshire Elec.	1	8	8	43/3	—	3 14 3

Home Rails.

Central London Ord. Assented	Stock	4	4	85½	—	4 13 7
Metropolitan	"	2½	1½	72½	+1	2 4 10
Do. District	"	4½	3	65½	+1	4 11 7
Underground Electric	1	7	4½	19/6	—	4 12 4

Telegraph and Telephones.

		1930	1931			
American Tel. & Tel.	$100	9	9	122½	—5	7 7 0
Anglo-Am. Tel. Pref.	Stock	6	6	102½	—	5 17 1
Do. Def.	"	1½	1½	24	—	6 2 5
Cables & Wireless 5½% Pref.	"	5½	2¾	81¼	—2	3 7 6
Do. A 7½% Ord.	"	—	Nil	27	—1	—
Do. B Ord.	"	—	Nil	10½	—¾	—
Globe Tel. and T. Ord.	10	8½	Nil	11	—	—
Do. do. Pref.	10	6	6	11¾	—	5 2 2
Great Northern Tel.	10	20	20	28	—½	7 2 10
Marconi-Marine	1	15	10	28/9	—	5 4 4
Oriental Telephone Ord.	1	12	12	3	—	*4 0 0

Home and Foreign Trams, Etc.

Anglo-Arg. Trams First Pref.	£	—	—	1/9	—	—
Do. do. 2nd Pref.	£	—	—	1/9	—	—
Do. do. 5% Deb.	Stock	—	—	£	—	—
British Electric Traction Def. Ord.	"	£	£	255	—	—
Do. do. Pref. Ord.	"	£	£	131	—	£ 19 5
Brazil Traction	100	—	—	11	+1	—
Brit. Columbia Elec. Rly. Pce.	Stock	£	£	102½	—	£ 19 6
London & Sub. Trac. 5% Pref.	1	Nil	Nil	16/-	—	—
London United Tram Deb.	Stock	£	£	75½	+2	£ 6 0
Mexico Trams, 5% Bonds	—	£	£	30½	—	£17 17 0
Mexican Light Common	100	Nil	Nil	9½	—	—
Do. 7% Pref.	100	7	7	15	—	—
Do. 1st Bonds	—	£	£	64½	—	£ 7 15 0
Victoria Falls Ord.	1	15	15	4½	—¼	£ 3 12 10
Yorkshire (West Riding)	1	Nil	Nil	6/-	—	— —

Manufacturing Companies.

Assoc. Elec. Ord.	1	6	4	15/9xd.	+6d.	£ 1 7
Do. Pref.	1	8	8	30/-	—	£ 6 8
Babcock & Wilcox	1	14	14	32/6	—1/6	£ 10 9
British Aluminium Ord.	1	10	£	25/-	—	£ 0 0
British Insulated Ord.	1	15	15	68/9	—1/6	£ 7 3
Brush Ord.	Stock	£	Nil	45	—	—
Callender's	1	15	15	2 1/16	—	£ 2 0
Do. 6½% Pref.	1	6½	6½	28/9	—	£ 10 5
Crompton Parkinson Ord.	£/-	30	24	21/6	—	£ 2 4
Do. 8% Pref.	1	8	8	32/-	—6d.	£ 0 0
Edison-Swan 1st Pref.	1	7½	7½	24/6	—	6 2 5
Do. 5% Deb.	Stock	£	£	102½	—	£ 17 7
Electric Construction	1	Nil	Nil	11/3	—	—
Enfield Cable Ord.	1	25	25	4½	—	£ 11 1
English Electric	1	Nil	Nil	7/6	—	—
Do. do. Pref.	1	Nil	Nil	11/3	—	—
Ever Ready	£/-	35	35	28/-	—9d.	6 £ 0
Ferranti Pref.	1	7	7	23/6	—	£ 19 2
G.E.C. Pref.	1	6½	6½	29/9	—	£ 7 5
Do. Ord.	1	10	8	2	—	£ 0 0
Henley's	1	30	30	6 1/16	—1/6	£ 17 0
Do. 4½% Pref.	£	4½	4½	5½	—	£ 5 9
India-Rubber	1	Nil	Nil	2/6	—	—
Johnson & Phillips	1	10	£	18/3	—	£ 9 7
Siemens Ord.	1	£	£	26/3	—	£ 14 3
Telegraph Construction	£1	Nil	Nil	18/3	—6d.	—

* Dividends paid free of Income Tax.

Published Specifications

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specifications will be printed and abridged and all subsequent proceedings will be taken.

1931

2998. "Method and apparatus for the purpose of controlling electrical energy." C. H. P. Wheatley. September 30th, 1931. (390178.)

21580. "Secondary cells or batteries." E. Almeida and Sir S. A. Du Cros. July 28th, 1931. (390192.)

24141. "Electric control systems." British Thomson-Houston Co., Ltd. August 28th, 1930. (390165.)

24397. "Electric motors." Lancashire Dynamo & Crypto, Ltd., and J. W. Howard. August 31st, 1931. (390195.)

26096. "Method of cleaning the contact members and other metal parts in electric switches operating in evacuated containers." Birka Regulator Ges. and E. Rozumek. September 17th, 1930. (390151.)

26885. "Vapour-electric devices." British Thomson-Houston Co., Ltd. September 26th, 1930. (390196.)

26983. "Photographic sound-recording apparatus." Electrical Research Products, Inc. June 19th, 1931. (390157.)

26984. "Television systems." Electrical Research Products, Inc. October 4th, 1930. (390158.)

26988. "Electric motor controllers." Allan West and Co., Ltd., and C. Johnson. September 28th, 1931. (390159.)

27007 "Electrical signalling systems." T. H. Flowers. September 28th, 1931. (Cognate application 8109/32.) (390161.)

27065. "Testing of a.c. feeder or like circuits." A. Reyrolle & Co., Ltd., F. Coates, and J. A. Harle. September 29th, 1931. (390169.)

27067. "Photo-electric control devices for use in electric signalling or control systems." Schneider et Cie. November 27th, 1930. (390170.)

27103. "Cinematograph and sound-reproducing apparatus." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. October 2nd, 1930. (390171.)

27127. "Electric valve circuits." British Thomson-Houston Co., Ltd. September 29th, 1930. (390184.)

27128. "Electric converting apparatus." British Thomson-Houston Co., Ltd. September 29th, 1930. (390200.)

27138. "Electric cables." Naamlooze Vennootschap Handelmaatschappij Cablon (Cablon Corporation). September 29th, 1930. (Patent of addition not granted.) (390173.)

27160. "Electrostatic sound-translating devices." Electrical Research Products Inc. October 20th, 1930. (390175.)

27408. "Joint or terminal for electric cables." Standard Telephones & Cables, Ltd., T. R. Scott, and J. K. Webb. October 2nd, 1931. (390208.)

27540. "Means for ventilating engine-electric locomotives or motor-coaches." Sir W. G. Armstrong Whitworth & Co. (Engineers), Ltd., C. M. Beckett, and C. J. H. Trutch. October 3rd, 1931. (390215.)

27631. "Sound-reproducing devices such as loud speakers." British Thomson-Houston Co., Ltd., L. B. Ault, and A. T. Stace. October 5th, 1931. (390223.)

27715. "Electric circuit breakers." A Reyrolle & Co., Ltd., and A. Allan. October 6th, 1931. (390226.)

27794. "Arrangement for the prevention of cross-talk." Telefonaktiebolaget L.M. Ericsson. October 7th, 1930. (390227.)

28781. "Electric clock movement." E. Butticaz. October 16th, 1931. (390232.)

29747. "Direct current motor control." Forges & Ateliers de Constructions Electriques de Jeumont. December 6th, 1930. (Addition to 386009.) (390235.)

30992. "Electrically heated irons for domestic use." E. Gill and R. J. Evans. November 9th, 1931. (390238.)

31037. "Electric cables." Johnson & Phillips, Ltd., and A. P. Pyne. November 9th, 1931. (390239.)

31885. "High-frequency electric oscillation apparatus for medical treatment." Siemens & Halske Akt.-Ges. November 13th, 1930. (390247.)

34201. "Electrodes or welding rods for use in electric-arc welding." Quasi-Arc Co., Ltd., and A. P. Strohmenger. December 8th, 1931. (390256.)

34296. "Electrically actuated totalisators." H. D. Black and A. A. C. Degen. December 10th, 1931. (390259.)

35120. "Apparatus for sealing vitreous envelopes." M-O Valve Co., Ltd., C. G. Eden, and C. J. Smithells. December 18th, 1931. (390266.)

35466. "Machine for automatically soldering terminal or connecting wires to the elements of electric dry batteries." A. H. Stevens (Autom Spezial-Maschinen Ges.). December 22nd, 1931. (390268.)

35484. "High-tension electrical insulators." Steatit-Magnesia Akt.-Ges. December 22nd, 1930. (390269.)

35786. "Artificial networks for a balancing line or cable impedance." Soc. des Téléphones Grammont. December 27th, 1930. (390271.)

1932

881. "Fittings for use in electricity distributing systems." F. C. Blackwell & Co., Ltd., and F. Firth. January 12th, 1932. (390276.)

1276. "Electric incandescent lamps for vehicles." S. G. S. Dicker (Naamlooze Vennootschap Philips' Gloeilampenfabrieken). January 15th, 1932. (390278.)

2121. "Electric disconnecting or fuse boxes, boards, or the like." A. F. M. Gatrill. January 23rd, 1932. (390286.)

3193. "Cooling arrangements of enclosed dynamo-electric machines." Laighpark Electric Motors, Ltd., and G. S. Young. February 3rd, 1932. (390291.)

3250. "Electro-mechanical power systems." C. Filmer and Associated Electrical Industries, Ltd. February 3rd, 1932. (390,292.)

3830. "Electric lampholders." J. D. Campbell. February 8th, 1932. (390294.)

5617. "Electric laundry or other smoothing irons." J. Jardine and British National Electrics, Ltd. February 25th, 1932. (390303.)

5881. "Electrical ignition and lighting systems of motor cycles." New Imperial Motors, Ltd., and N. T. Downs. February 27th, 1932. (390304.)

7189. "Control of circuits by means of electron tubes." Igranic Electric Co, Ltd. March 13th, 1931. (390309.)

7444. "Discharge tubes and other exhausted and gasfilled spaces." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. June 8th, 1931. (390311.)

8373. "Fusible cut-outs." International General Electric Co., Inc. March 21st, 1931. (390317.)

8879. "Insulated electric conductors." International General Electric Co., Inc. March 27th, 1931. (390322.)

10090. "Electric starting of internal-combustion engines." H. O. Burge, L. H. D. Jones, and E. D. Jones. April 8th, 1932. (390325.)

12281. "Liquid-tight closures for use in connection with subaqueous vibration transmitting or receiving apparatus." C. L. Florisson and Soc. de Condensation et d'Applications Mécaniques. December 18th, 1931. (390332.)

12648. "Metal-vapour rectifiers." Akt.Ges. Brown Boveri et Cie. May 2nd, 1931. (390333.)

13232. "Electric condensers." International General Electric Co., Inc. May 9th, 1931. (390336.)

13289. "Combination electric switch, with variable combination." C. H. Moss. May 9th, 1932. (390338.)

15214. "Insulated windings for electrical machines." International General Electric Co., Inc. May 29th, 1931. (390346.)

15455. "Wireless receiving apparatus." T. A. Biddington and R. Field. May 31st, 1932. (390348.)

15556. "Liquid-break electric switches." International General Electric Co., Inc. June 1st, 1931. (390349.)

17080. "Insulating spacers." British Thomson-Houston Co., Ltd. June 22nd, 1931. (390361.)

17308. "Electric water heaters." D. G. Petrie. December 21st, 1931. (Divided application on 8656/31.) (390362.)

19840. "Dynamo-electric machines." Naamlooze Vennootschap Machinersieen-en Apparaten Fabrieken. July 13th, 1931. (390376.)

20318. "Method of manufacturing insulating sleeves." A. V. Holm Aktiebolag, O. E. Vilen, and T. G. Bergnehr. July 18th, 1932. (390380.)

20551. "Systems for the electrical transmission or recording and reproduction of sound." Siemens & Halske Akt.-Ges. July 20th, 1931. (390383.)

20625. "Electric lamps." British Thomson-Houston Co., Ltd. July 21st, 1931. (390384.)

20642. "Apparatus for obtaining connections in automatic telephony systems." A. Boye. July 30th, 1931. (390385.)

21093. "Radio and like transmitting systems." Marconi's Wireless Telegraph Co., Ltd. June 13th, 1932. (390390.)

22501. "Luminous electric discharge tubes." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. August 19th, 1931. (390395.)

22604. "Electric battery lamps." J. J. Pala. August 12th, 1932. (390396.)

23508. "Picture and like transmission systems." Marconi's Wireless Telegraph Co., Ltd. August 22nd, 1931. (390400.)

24002. "Electric discharge devices." British Thomson-Houston Co., Ltd. August 27th, 1931. (390405.)

24519. "Electric motor control systems." British Thomson-Houston Co., Ltd. September 3rd, 1931. (390409.)

26344. "Automatic press machines for producing electrodes for galvanic elements." W. Hasse. September 22nd, 1932. (Addition to 330082.) (390419.)

26977. "Electric flash-light bulbs." Sashalite, Ltd., October 7th, 1931 (390427.)

29357. "Electric adaptors." S. C. Pritchard. October 20th, 1932. (390445.)

32671. "Electrical fuses." Allan West & Co., Ltd., A. West, and V. Breeze. October 2nd, 1931. (Divided application on 27457/31.) (390220.)

34839. "Automatic synchronising devices." N. K. Tchen. December 10th, 1931. (390466.)

Trade Mark Applications

The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from April 19th :—

Zenith. No. 526457. All goods, with certain exceptions, in Class 8.—Zenith Electric Co., Ltd., Zenith Works, Villiers Road, Willesden Green, N.W.2.

Percolite. No. 539997. All goods in Class 8.—Aerialite, Ltd., 10, Amber Street, Manchester.

Homac. No. 538205. Class 50. Synthetic resins sold in solid or powdered form for moulding purposes.—Walton Chemical Co., Ltd., Bull Lane, Aintree, Liverpool.

Electric Soldering

THE mechanical strength of soft solders depends upon the constitution of the solder; the design of the joints; the cleanliness of the surfaces to be soldered; the proper use of correctly designed tools; the composition and proper use of flux, and the speed of soldering. Therefore, the degree of strength required for joints should be kept in view in choosing a solder for a given class of work. The soldering tool must have capacity adequate for the work upon which it is employed and the iron must be hot enough to bring the work to the proper fusing temperature of the solder, but not hot enough to cause undue corrosion of the soldering tip. The heating element of electric soldering tools should be designed to furnish sufficient heat to supply continuously not only the heat lost, but also to keep the work being soldered heated by conduction. If, while connected to the line, the soldering tool is idle, the heat must be radiated or convected away by the surrounding atmosphere, else the tinned surface is burned and becomes pitted and crusted, making it necessary to file the copper tip and re-tin it with flux and solder.

New Work for Contractors

Particulars of new works and building schemes for the use of electrical installation contractors and traders

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Andover.—Municipal offices; borough surveyor.

Ashtead (Surrey).—Postal sorting office; H.M. Office of Works, King Charles Street, S.W.1.

Bedford.—Bazaar stores; F. W. Woolworth & Co., Ltd., London.

Bedfordshire.—School, Haynes; county surveyor, Bedford.

Bexhill-on-Sea.—Houses (28), St. George's Road; Thorpe & Co. Entertainment hall (£50,000), Coastguard site; borough engineer.

Birmingham.—Baptist church, Stratford Road, Hall Green (£6,000); Rev. E. Knight. Factory premises, Brook Street, St. Paul's, for the Birmingham Buckle Works (electrical installation); T. Elvins & Son, builders, Naden Works, Soho, Birmingham.

Blackpool.—Houses (94) and shops (12), Fleetwood Road, for H. B. Pownall, Bispham House, Norbreck Road, Bispham (electric lighting installations); T. Walsh, builder, The Bungalow, St. Nicholas Road, Marton Moss.

Blackwell (Notts).—Houses (24), Pinxton; H. T. Sudbury, architect, Rutland Chambers, Ilkeston.

Bootle.—Schools, Peel Road, for Rev. H. V. O'Neil (electrical installation); A. Ellis, architect, The Temple, Dale Street, Liverpool.

Boston.—Rebuilding bazaar stores, Market Place; Marks & Spencer, Ltd., London. Factory, Norfolk Street; United Canners, Ltd.

Bridport.—Houses (24), Court Orchard Estate; borough surveyor.

Bromborough.—R.C. church; C. Manning, builder, Birkenhead.

Bury.—School, Elton, with electric lighting installation (£7,600); J. Gott, builder, Pilsworth Road, Heywood.

Bury St. Edmund's.—Girls' school for Borough E.C.; J. H. Wakefield, secretary.

Camborne.—Houses (10), Council Estate; U.D.C. surveyor.

Cambridge.—Church, Little Wilbraham; Rattee & Kett, Ltd., builders. Reconstruction and extension of Guildhall (electrical work); C. Cowles-Voysey, architect.

Cardiff.—Nurses' home, &c., isolation hospital (£25,319); W. S. Eglen.

Carlisle. — Extensions, Cumberland Infirmary (£10,000); S. W. B. Jack, architect, Lloyds Bank Chambers.

Chatham.—Houses (32); Horace Newby, Ltd., builders, Ramsgate.

Chingford.—Sewage disposal works extensions, with pump house, &c.; S. J. Hellier, engineer.

Clydebank.—Iron foundry for D. and J. Cullis, engineers, Kilbowie; manager.

Cosham (Hants).—Cinema, with electrical work, High Street (£30,000); R. A. Thomas, architect, 6, Havant Road.

Darlington.—Houses (20), Park Crescent; H. Parvin and Sons, builders, 17, Horsemarket. Out-patients' department (£15,000), Memorial Hospital; secretary.

Dover.—Houses (50), Manor Road, Maxton; Holroyd & Gilham, Swanley. Rebuilding covered market and museum (£11,000); borough surveyor.

Dudley.—Shops, Wolverton Road; borough engineer.

Dumfries.—Extensions, Acadamy (£27,000); master of works, County Education Committee.

Dundee.—Improvements, Head Post Office; postmaster.

Durham.—Alterations, Esh Winning Council School (£1,725); F. Willey, architect, 34, Old Elvet.

Easington (Durham).—Houses (350); C. W. Clarke, surveyor, Council Offices.

Epping.—Houses (74), Coopersale, for H. E. J. Camps.

Forfar.—Extensions, County Buildings (£3,200); county clerk.

Freckleton.—Dance hall and café, Lytham Road (electric lighting installations); E. Bowman, builders, Don Saw Mills, St. Annes-on-Sea.

Gillingham (Kent).—School (300 places); J. L. Redfern, borough engineer.

Glasgow.—Hospital; city architect.

Grays.—Baptist church (£2,350), Socketts Heath; Brown Bros., builders.

Greenock.—Two R.C. churches; Archdiocese of Glasgow.

Halesowen.—Estate development, Springfield Road; Housing, Ltd., Blackheath, Birmingham.

Hanworth.—Houses (3,000), Hanworth Park Estate; New Ideal Homesteads, Ltd., Ideal House, Carlton Road, Erith, Kent.

Hastings.—Estate development, Sedlescombe Road North (electrical work); Fryer & Sons.

Haydock.—Houses (80), Penny Lane site; U.D.C. surveyor.

Hemel Hempstead.—Houses (120), Woodall, for Brock & Co., London.

Hertfordshire.—School, Leavesden Housing Estate, Watford; director of education, Hertford.

Irish Free State.—(Athlone, Co. Westmeath).—Houses on the Bellaugh site (60) and Retreat site (31); Owen Doyle, town surveyor. (Dublin).—Additions and alterations, St. Peter's National Schools, Whitefriar Street, for Carmelite Fathers; J. William O'Sullivan, architect, Grafton Chambers, 102-103, Grafton Street. (Mullingar, Co. Westmeath).—Additions to mental hospital; J. R. Boyd-Barrett, chartered architect, 61, South Mall, Cork. (Templemore, Co. Tipperary).—Technical school; Vocational E.C., Nenagh; V. Kelly, architect, 87, Merrion Square, S., Dublin.

Kettering.—New wards, General Hospital, Rothwell Road; governors.

Knaresborough.—Houses (24), Frogmire Estate; U.D.C. surveyor.

Largs (Ayrshire).—Reconstruction work, Royal Hotel (£1,750); the proprietor.

Laurieston (Stirlingshire).—Four blocks of houses for C.C.; Wilson & Tait, architects, Grangemouth.

Leeds.—Factory premises for Messrs. Prices (Tailors 1928), Ltd., 55, Vicar Lane; Wm. Irwin & Co., builders, 2, Burley Road.

London.—(Acton).—Flats (24), First and Second Avenues; J. M. Wilson, architect, Hayes. Factory, Western Avenue; Sir Aston Webb & Son, architects. (Bermondsey).— Flats, Amos Estate (£17,573) and Bethel Place (£26,110), and clearance, Neptune Street area; Corporation Works Department. (Ealing).—Houses (74), Jordan Road and Torrington Gardens, for the Hillingdon Estate Co.; Swannell & Sly, architects, High Street, Rickmansworth. Houses (19), Pope's Lane; J. Atherton & Co., 134, East Acton Lane, W.3. Church for St. Thomas the Apostle, Boston Road; E. Maufe, architect, 4, Pickering Place, S.W.1. Factory for W. H. Dean & Co., Ltd., Uxbridge Road; W. H. Read & Co., architects. Flats, North Common Road; D. C. Waring, architect, 16, Southwark Street, S.E.1. Alterations and additions, Central London Throat, Nose and Ear Hospital, Castle Bar Hill; Eiloart, Son, & Inman, architects.

Lowestoft.—Houses (27), Kimberley Road; J. A. Gaze & Sons. Factory, Battery Green Road; R. J. Pryce & Co., Ltd.

Macclesfield.—Houses (32), for F. M. Bonnaud; Byrons Lane.

Maidstone.—School (450 places), Sandling Lane; director of education.

Manchester.—Houses (80), Hemmons Road, Sutcliffe Avenue and Norton Avenue, Longsight; J. W. Maunders, 21, Grange Avenue, Stretford.

Melton Mowbray.—Cinema for Thorpe Syndicate, King Street (electrical installation); James Chapman & Sons, Ltd., builders, Knighton Junction, Wellford Road, Leicester.

Middlesex.—Technical Institute, Dudden Hill, Willesden; extensions, Green Elementary School, Isleworth, and Technical College, Southall; and remodelling Tottenham Polytechnic; County E.C.

Newbury.—Church, Andover Road; J. Longley, Ltd.

Newcastle-on-Tyne.—Houses (46), Coast Road; G. C. Haddon, builder, Huddlestone Road, Heaton. Offices, Forth Street, for J. H. McArdle, Ltd.; P. L. Browne & Sons, architects, Pearl Buildings, Northumberland Street. Alterations, Eskdale Terrace Grammar School; Marshall & Tweedy, architects, 129, Pilgrim Street. Tankersville Terrace High School; Newcombe & Newcombe, architects, 23, Eldon Square. Rebuilding B.B.C. studio, New Bridge Street; Broadcasting House, W.1.

Newport (Mon).—Houses (53), Barthrop Street; J. Paley Ward. Works extensions, Lillieshall Road; Basic Slag & Phosphate Co., Ltd.

Norwich.—Additions to factory, Oak Street, for F. Hinde & Hardy, Ltd. (electrical installation); J. O. Bond, architect, 25, Tombland.

Oswaldtwistle.—Bakery, Heys Lane, for the Co-operative Society, 315, Union Road; Society's architect.

Oxford.—Rebuilding the New Theatre, George Street (£25,000), with electrical installation; T. H. Kingerlee & Sons, builders, Abbey Road Works, Osney.

Petersborough.—School (600 places), Fulbridge; director of education.

Prescot.—Town hall and municipal offices; U.D.C. surveyor.

Ramsgate.—Houses (52), Nethercourt Hill; Messrs. Horshams, surveyors, Romford.

Redditch.—Houses (110); E. L. Lewis, builder.

Sanderstead.—Houses (100), Croham Heights Estate; R. Costain & Sons, Ltd.

Sheffield.—Houses (120), Woodthorpe Estate; city architect.

Shipston-on-Stour.—Council chamber; E. H. Earp, architect, 48, Henley Street, Stratford-on-Avon.

Shropshire.—School, Alveley; education architect, Shrewsbury.

Smallburgh (Norfolk).—Houses, Hempstead (328) and Eccles (87), for E. Bush; F. W. Skipper, architect, 55, London Street, Norwich.

Somerset.—Schools, Weston-super-Mare and Timsbury; A. J. Toomer, county architect, Park Street, Taunton.

Southend-on-Sea.—Houses (122), Leigh Estate; borough engineer.

Stafford.—Tailoring premises, Goalgate Street, for Montague Burton, Ltd.

Stratford-on-Avon.—Houses (200); M. H. Powell, architect, Colmore Road, Birmingham.

Streatley.—Casual wards (£14,277), with electrical and heating work, for Herts C.C.; W. Laughton, builder, Bedford.

Sunbury-on-Thames.—Headquarters, Ex-Servicemen's Association; B. Royce, architect, 22, Mackenzie Street, Slough.

Surrey.—Secondary school, Bushey Mead, Merton, for County E.C.; W. W. Finny, secretary, Kingston-on-Thames.

Sutton (Surrey).—Cinema, Carshalton Road; Lew Morris.

Swanscombe.—Houses (60); U.D.C. surveyor.

Swansea.—Office and showrooms, Neath Road, Landore; J. Owen Smith. Extensions, High School for Girls (£14,969); L. H. Samuel.

Tanfield (Durham).—Houses (51), White-le-Head; J. R. Heslop, surveyor.

Taunton.—Extensions, Victoria Rooms, with shops (£4,980); Stansell & Son, builders, Billet Street.

Teddington.—Maisonettes and flats; U.D.C. surveyor.

Todmorden.—Houses (54), Ashenhurst Estate (£18,854); borough engineer.

Twickenham.—Houses (134) in connection with Part 2 of the Forty Acre Field scheme (£38,852); borough engineer. Shops and flats (13), Poulette Lodge Estate; Brewer, Smith & Brewer, architects, 11, The Green, Richmond.

Upholland (Lancs).—Houses (54); U.D.C. surveyor.

Wallasey.—Houses (102), Mersey Street; borough engineer. Elementary school, Pasture Road, and Catholic School, Moreton, for E.C.

Worcester.—Three schools; director of education. Houses (164), Tolladine Road Estate; borough surveyor.